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ILLINOIS NATURAL HISTORY SURVEY

Des Plaines River Long-Term Monitoring Program: Phase 1

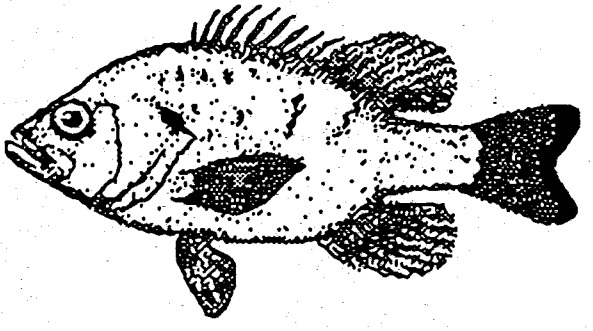
Aquatic Biology Section
Technical Report

Richard E. Sparks
Co-Principal Investigator

and

Pamela P. Tazik
Co-Principal Investigator

Final Report
Submitted to
Commonwealth Edison Co.,
Chicago, Illinois



Aquatic Biology Technical Report 1986(6)

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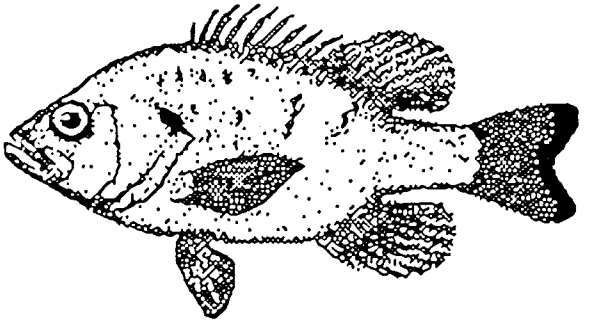

Aquatic Biology Technical Report 1986(6)

AB Tech Report 1986 (6)

DES PLAINES RIVER LONG-TERM MONITORING PROGRAM

PHASE I REPORT

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Illinois Natural History Survey

FINAL REPORT

12 December 1986

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DISCLAIMER

This report was prepared for the Commonwealth Edison Company which funded this research. The findings, conclusions, recommendations, and views expressed are those of the researchers and should not be considered as the official position of the Commonwealth Edison Company.

DES PLAINES RIVER LONG-TERM MONITORING PROGRAM

PHASE I REPORT

INTRODUCTION

The major objective of Phase I of the Des Plaines River Long-Term Monitoring Program was to monitor and evaluate habitat quality in a 21-km (13-mile) reach of the Des Plaines River between Brandon Road Lock and Dam (river mile 286) and the confluence of the Des Plaines and Kankakee rivers (river mile 273) (Fig. 1). The data collected in the summer and winter of 1985-1986 provide a benchmark for assessment of changes in habitat, vegetation, and macroinvertebrates.

Phase I of the monitoring program consisted of two components: (1) an aquatic macrophyte component which identified and mapped major vegetation types and habitats (data collected July-August 1985) and (2) a benthic macroinvertebrate component which included evaluations of macroinvertebrate habitats and sampling methods (data collected July-August 1985) and a winter survey of benthos (samples collected January 1986) for comparison with collections of 1984 (Ecological Analysts 1984) and 1977 (Nalco Environmental Sciences 1978).

The study site, located in Will and Grundy counties, Illinois, included the Des Plaines River from Brandon Road Lock and Dam to the confluence of the Des Plaines and Kankakee rivers, and Grant Creek, a tributary of the Des Plaines River, which enters near river mile 274 (Fig. 1). A number of industries, including Mobil Oil, AMOCO, Olin Matheson, Commonwealth Edison, and Rexall Chemical, are located along this reach. Treated effluents from the Metropolitan Sanitary District of Greater Chicago released into the Sanitary and Ship Canal ultimately enter the Des Plaines River 6.4 km (4 miles) upstream of the study reach.

SECTION 1

VEGETATION ANALYSES AND HABITAT CHARACTERIZATION

by Pamela P. Tazik

INTRODUCTION

Macrophytes are an integral part of aquatic systems. They modify and diversify habitat and fuel secondary production. Macrophytes produce oxygen, cycle nutrients, stabilize sediments, provide cover for fishes, and supply food and substrate for macroinvertebrates and microorganisms (Richardson 1921, Bennett 1971, Raschke 1978, Wright et al. 1981, Wiley and Gorden 1984, Barko et al. 1986). The average macrophyte-associated fauna can be as much as eight times that of the average biomass of bottom fauna, such as fingernail clams and aquatic earthworms (Richardson 1921). Macrophytes also modify flow velocities and patterns, altering the amount and location of sediment deposition, light penetration, and other environmental characteristics (Hynes 1970, Westlake 1973). Thus, aquatic habitat quality, except in systems that are phytoplankton or detritus based, is largely governed by presence and characteristics of macrophytes. To assess habitat quality and the potential for a productive fishery, macrophyte populations must be examined.

Submersed and floating aquatic plants once flourished in the Illinois River Valley. Since the early 1960's, submersed and all but one species of floating plants have virtually disappeared from the Illinois River and its bottomland lakes. A 1978 survey indicated that occasionally conditions exist that allow limited growth of submersed aquatic plants more tolerant of turbidity and pollution such as Potamogeton spp., Vallisneria americana, and Ceratophyllum demersum (Havera et al. 1980).

The major objective of this component of the Des Plaines River Long-Term Monitoring Program was to document the species and extent of aquatic macrophytes occurring in the study reach to provide a benchmark for comparison with future surveys of vegetation and habitat.

MATERIALS AND METHODS

Aquatic vegetation data were collected during a 2-week period in July and August 1985. Vegetation was mapped, plant specimens were collected for identification and archiving in the Illinois Natural History Survey's herbarium, and standing crop biomass was measured.

Aquatic vegetation was mapped by recording location and extent of submersed and emersed vegetation beds on base maps. Base maps consisted of enlarged U. S. Geological Survey (USGS) 7.5-minute series topographic quadrangle maps that were produced in 1954 and photorevised in 1973. Since then, river boundaries at some locations have shifted. Deviations from USGS maps as observed during field collections and on aerial photographs were incorporated onto the base maps.

Updated maps of the river reach with combined aquatic vegetation data were digitized and entered into the Geographic Information System (ARC/INFO) at the Illinois Natural History Survey. After digitizing, coverage of plant beds and habitat classes were calculated using the INFO system.

Location and extent of many plant beds were delineated using the Motorola Mini-Ranger III System (MRS III). This system provides a means of determining the position of a mobile unit, such as a boat, with respect to two radar transponders located at fixed reference points. The MRS III operates on the basic principle of pulse radar. A receiver-transmitter assembly, which is mounted on the mobile unit, is used to interrogate two reference stations. Elapsed time between transmitted interrogation signal and each of the two reply signals is used to determine the range of each reference station. Range information can then be used to locate the position of the mobile unit, positioned at a plant bed, by triangulation. The MRS III was on loan from the Upper Mississippi River Basin Association to the Illinois Natural History Survey River Research Laboratory, Havana, Illinois.

Transect methods were used to characterize and map vegetation. The line transect method, a plotless sample technique, is typically used to determine frequency of occurrence and results are expressed as a percentage of the total number of data points collected. Location and extent of plant beds are recorded continuously or at designated intervals along transect lines (Ager and Kearce 1970, Holcomb and Wegener 1971, Kershaw 1973, Mueller-Dombois and Ellenberg 1974, Raschke 1978). This method was used in three areas. Below Brandon Road Dam, transect lines were established at 60-m intervals from the left bank (facing downstream) into the river as far as one could safely walk; distances were measured using a fiberglass tape measure. At the mouth of the Du Page River, transect lines were established at 200-m intervals from the right bank into the main channel; measurements were made using the Mini-Ranger III. Near the confluence of the Kankakee and Des Plaines rivers, transect lines were established at 100-m intervals along the right bank downstream from the overflow of the Illinois & Michigan Canal and

extended to the left bank; data were collected using the Mini-Ranger III.

A second method, belt transects, was used concurrently with line transects; size and number of plant beds within 1 m of either side of the transect line were recorded (Mueller-Dombois and Ellenberg 1974, Raschke 1978). This sample plot technique yields cover estimates for species within the sample plot (2-m belt) in addition to frequency of occurrence data. Using these data, estimates of relative species abundance were obtained.

Low-altitude aerial color photographs of the study reach (Aero-Metric Engineering Co.) were taken during the last week of July 1985. The photographs documented the location and extent of plant beds in the reach. Photo interpretation data were combined with species abundance and cover data generated by ground-truth mapping (including transect analysis, visual estimates, and hand mapping) to produce detailed vegetation maps.

Habitats were classified using the Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al. 1979), a hierarchical system used to describe and inventory wetland and deepwater resources nationwide. This system aids in resource management decisions and provides uniformity in terminology and concepts (Cowardin et al. 1979).

Representative specimens of aquatic plants collected during the survey were identified and preserved. Identifications were made to species when possible; this is often dependent upon the presence of seeds and/or flowering structures (Fassett 1940, Muenscher 1944, Beal 1977). Specimens were archived in the Illinois Natural History Survey herbarium, and identifications were verified by taxonomists at the Illinois Natural History Survey (Section of Botany and Plant Pathology).

Macrophyte standing crop was measured by quadrat sampling (Tazik and Wiley 1985). A cylindrical hardware cloth sampler (0.25-m^2 area) with sheet metal support at the bottom was lowered into a submersed plant bed; all plant material from within the sampler was raked out. Emersed macrophytes were sampled with a ring sampler (0.25-m^2 area) that was lowered over the plants and secured in shallow-water sediments. Plants were then cut at the sediment-water interface and collected (Tazik and Wiley 1985).

Immediately following collection, macrophyte samples were rinsed in a sieve (5-mm mesh) and placed in labeled bags. On shore, submersed plant samples were spun to remove excess water. Fresh weights were measured using an Ohaus balance. Emersed macrophytes were weighed after sediments and excess water had been removed. Where necessary, samples were sorted by species. Samples of each macrophyte species were returned to the Illinois Natural History Survey laboratory to obtain dry weights (Tazik and Wiley 1985).

RESULTS

MACROPHYTE TAXA

Seventeen aquatic macrophyte species were collected from the study reach (Table 1). Ceratophyllum demersum, Elodea canadensis, Myriophyllum sp., Vallisneria americana, and all but one Potamogeton species are submersed aquatic macrophytes and all are rooted plants except the floating macrophyte C. demersum. Dianthera americana, Phragmites communis, Sagittaria latifolia, Scirpus sp., and Typha spp. are emersed macrophytes. Nelumbo lutea and Potamogeton sp. were the only floating-leaved macrophytes collected during sampling. Eleocharis aciculara was found completely submersed in the upper reaches of the study area, but it can also thrive when not inundated (Beal 1977).

Although Calamagrostis, Graminacea, and Polygonum sp. were collected near the islands just below Brandon Road Dam, they are not true aquatic macrophytes (unless Polygonum sp. is P. fluitans). These plants frequently tolerate inundation resulting from water-level regulation at the dam.

TRANSECT ANALYSIS

Potamogeton spp. and Myriophyllum sp. were the most abundant macrophytes in the Brandon Road area (Table 2). Vallisneria americana occupied nearly 40% of the vegetated area at the mouth of the Du Page River; Myriophyllum sp. and P. pectinatus were abundant in that area as well. Three submersed macrophytes of equal abundance at the rivers' confluence were V. americana, P. pectinatus, and P. crispus (Table 2).

AQUATIC VEGETATION IN THE DES PLAINES RIVER (River mile 273-286)

Over 46 ha of the study reach contained aquatic vegetation (Table 3, Fig. 2). The areas most heavily vegetated were located near river miles 273, 277-278, 279-280, and 285-286. Sagittaria latifolia, Potamogeton crispus, P. pectinatus, and Myriophyllum sp. covered 73% of the total vegetated area in the study reach (Table 3). Sagittaria latifolia occupied nearly 12 ha (25% of the total vegetated area) and was the dominant species in several areas of the reach. Potamogeton crispus comprised 23% of the total vegetated area (10.72 ha) and was particularly abundant just below Brandon Road Dam and at the confluence of the Des Plaines and Kankakee rivers. Potamogeton pectinatus, a narrow-leaved macrophyte, covered 5.74 ha (12% of the total vegetated area), and Myriophyllum occupied 5.35 ha (11% of the total); both species were abundant at the mouth of the Du Page River and just below Brandon Road Dam.

Submersed and floating-leaved macrophytes covered 31 ha of the study reach (Table 3). A large portion of the submersed macrophyte population was composed of Potamogeton spp. (65%) and Myriophyllum sp. (17%). Emersed vegetation covered 15 ha of the

reach. Sagittaria latifolia inhabited nearly 12 ha (78% of the area) and Typha spp. inhabited 3 ha (20% of the emersed vegetated area) (Table 3).

To facilitate analysis of results, the 13-mile study reach was divided into segments. Segments of similar length were delimited without separating heavily vegetated areas. Cover and composition of plant populations in each segment are discussed individually (Fig. 3-10, Tables 4-6). Artificial water boundary lines were drawn in selected segments to permit percent cover calculations in heavily vegetated areas. Results by study reach segment are followed by standing crop and habitat classification results.

VEGETATION ANALYSES BY RIVER SEGMENTS

Segment 1. River mile 284.5-286, Brandon Road Lock and Dam.

Segment 1 was the most heavily vegetated segment. Species inhabiting this area included Myriophyllum sp., Potamogeton pectinatus, P. crispus, P. zosteriformis, Potamogeton sp., Eleocharis aciculara, Typha spp., Sagittaria latifolia, and Scirpus spp. (Tables 4 and 5). Myriophyllum sp. and Potamogeton spp. covered over 11 ha, or 84%, of the vegetated area (Tables 4-6).

Submersed macrophytes covered 12.1 ha, or 92%, of the vegetated area; the remainder was emersed vegetation (Fig. 3, Tables 4-6). Most emersed vegetation was Sagittaria latifolia, which was located downstream of Commonwealth Edison's Power plant units. Segment 1 covered 66 ha, 20% of which was vegetated. The side channel area within the water boundary lines (31 ha) was nearly 36% vegetated (Fig. 3, Table 6).

Segment 2. River mile 282-284.5.

Only 1.92 ha, or 2.2%, of the 88 ha in this segment were vegetated (Tables 4 and 6). The dominant macrophyte, Sagittaria latifolia, occupied 94% (1.82 ha) of the vegetated area and submersed vegetation occupied the remaining 6% (Fig. 4, Tables 5 and 6).

Segment 3. River mile 280-282.

Only emersed macrophytes, Sagittaria latifolia, Typha spp., and Phragmites communis, inhabited this sparsely vegetated area (2.7% of the 78 ha of water) (Table 4). Sagittaria latifolia covered 1.78 ha, or 83%, of the vegetated area. Typha spp. and P. communis occupied the remainder of the vegetated area (Tables 4 and 5, Fig. 5).

Segment 4. River mile 278.2-280, Treats Island area.

Although this segment contained considerably more vegetation than the previous two segments, the dominant emersed macrophytes

were also Sagittaria latifolia and Typha spp. (Fig. 6, Table 4). There were 7.1 ha of S. latifolia and 1.67 ha of Typha spp. (96% of the vegetated area) in the side channel at Treats Island (Table 4). Vallisneria americana, Myriophyllum sp., and Phragmites communis contributed the other 4% (Tables 4 and 5). Of the 71 ha in this segment, 12.8% was vegetated. The side channel at Treats Island (indicated by the arbitrary water boundary lines) contained most of the vegetation and was the second most heavily vegetated area within the study reach (39% vegetated) (Table 6, Fig. 6).

Segment 5. River mile 276.5-278.2, Mouth of the Du Page River.

The area at the mouth of the Du Page River contained nearly 13 ha of vegetation; 12 ha were occupied by submersed macrophytes (Table 4, Fig. 7). The three most abundant macrophytes were Myriophyllum sp., Vallisneria americana, and Potamogeton pectinatus (Tables 4 and 5). Of 141 ha within the artificial water boundary lines, 12.76 ha (9%) were vegetated (Fig. 7, Table 6).

Segment 6. River mile 275-276.5, Will County Forest Preserve Island.

Of the 0.2 ha of vegetation near Will Co. Forest Preserve Island (Table 4), Ceratophyllum demersum, Potamogeton pectinatus, and P. zosteriformis covered 0.08 ha (Fig 8). A bed of Typha spp. near river mile 275 comprised over 50% of the vegetated area (Tables 4 and 5, Fig. 8). The surface area of this segment was 110 ha, only 0.2% of which was vegetated (Table 6).

Segment 7. River mile 273.5-275, Grant Creek.

No aquatic vegetation was present in the river proper, but Grant Creek contained nearly 1 ha of vegetation (Fig. 9, Table 4). Nelumbo lutea, a floating-leaved macrophyte, covered 0.47 ha or 48% of the total vegetated area (Fig. 9, Tables 4 and 5). Submersed vegetation included Ceratophyllum demersum, Myriophyllum sp., Potamogeton pectinatus, and Potamogeton sp.; and emersed vegetation included Typha spp., Sagittaria latifolia, and Dianthera americana (Fig. 9, Tables 4 and 5). Grant Creek (see water boundary lines) covered 26 ha, 3.7% of which was vegetated (Table 6, Fig. 9).

Segment 8. River mile 273-273.5, Confluence.

This segment was the third most heavily vegetated segment. Of the 39 ha within the water boundary lines, 6.11 ha (15.7%) were vegetated (Fig. 10, Tables 4 and 6). Potamogeton crispus covered 90% (5.5 ha) of the vegetated area (Tables 4 and 5). Potamogeton pectinatus and Typha spp. occupied 4% and 2% of the vegetated area, respectively. Other macrophytes present included Vallisneria americana, Potamogeton sp., Myriophyllum sp., and Sagittaria latifolia (Tables 4 and 5).

MACROPHYTE STANDING CROP

Standing crop estimates were based on a total of 60 macrophyte biomass samples. Standing crop estimates ranged from 12.8 to 252.7 g dry weight m^{-2} for submersed vegetation and 712.4 to 3,612.2 g dry weight m^{-2} for emersed vegetation (Table 7). Ceratophyllum demersum, Nelumbo lutea, and Potamogeton crispus had the lowest standing crop per unit area, while Phragmites communis had the highest (Table 7).

Using the areal coverage and standing crop estimates, total standing crop for the study reach was calculated (Table 7). Sagittaria latifolia produced the most plant biomass in the reach (84,633 kg) followed by Typha spp., Myriophyllum sp., Vallisneria americana, Potamogeton pectinatus, and Phragmites communis (Table 7). Submersed macrophytes produced an estimated 32,258 kg of biomass and emersed macrophytes 120,705 kg for a total of 152,963 kg. Assuming sampling occurred during peak standing crop, approximately 152,963 kg of aquatic vegetation was produced during the growing season and vegetated areas averaged 3,307 kg ha^{-1} or 331 g m^{-2}.

CLASSIFICATION

The study reach is classified as Riverine System which includes all wetlands and deepwater habitats within a channel except (1) wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens, and (2) habitats within water containing ocean-derived salts in excess of 0.5% (Table 8) (Cowardin et al. 1979).

The study reach has water flowing throughout the year and substrates of rock, cobble, or gravel with occasional patches of sand; it is classified in the Upper Perennial Subsystem. Side channel areas and some channel border areas, such as at the mouth of the Du Page River, are in the Lower Perennial Subsystem, which includes areas of low water velocity and sand and mud substrates.

Class, the next step in the hierarchy, is the highest taxonomic unit and describes the general appearance of habitat in terms of vegetative life form or physiography and composition of substrate. Data collected in 1985 allows classification of study reach areas according to vegetative life form.

Nearly all vegetated areas of the study reach are in one of two classes, Aquatic Bed or Emergent Wetland. Aquatic Bed includes diverse plant communities that require surface water for optimum growth and reproduction (Cowardin et al. 1979). Most submersed vascular macrophytes in this reach belong to the Rooted Vascular Subclass which includes macrophytes with submersed and floating leaves. Ceratophyllum demersum is a non-rooted submersed macrophyte and is classified in the subclass Floating Vascular.

The Emergent Wetland Class includes persistent and nonpersistent subclasses. Most emersed macrophytes in the reach are nonpersistent because they fall to the surface of the substrate or below the water surface at the end of the growing

season (Cowardin et al. 1979). Phragmites communis persists year-round and belongs in the Persistent Subclass. The Persistent Subclass is in the Palustrine System (Table 8), so a small part of the study reach (0.13 ha of Phragmites communis) is not in the Riverine System.

Habitats within the study reach of the Des Plaines River may also be classified according to a system developed for scientific study and fisheries management by the Upper Mississippi River Conservation Committee (Rasmussen 1979). Habitat classifications include main channel, main channel border, tail waters, side channels, river lakes and ponds, and sloughs. Classifications found within the Des Plaines study reach include main channel, main channel border, side channel, and slough.

The main channel includes that portion of the river through which commercial craft can operate (Rasmussen 1979). Within the study reach the main channel accounts for 35.4% of the water surface area and contains no vegetation. Main channel border exists in the zone between the navigation channel and the main river bank, islands, or submerged definitions of the old main river (Rasmussen 1979). Main channel border habitats encompass 28.8% of the study reach and contain 4.8 ha of emersed and 0.1 ha of submersed vegetation, primarily in segments 1,2 and 3 of the reach (Fig. 3-5; Table 4).

Side channels include all departures from the main channel and main channel border in which there is current during normal river stage (Rasmussen 1979). Side channels cover 34% of the study reach and contain 81% of the macrophyte vegetation. Sloughs are narrow branches or offshoots of the main water body and are characterized by no current at normal water stage. They may be former side channels that have been cut off (Rasmussen 1979). Only 1.8% of the study reach is classified as slough habitat and those areas contain a total of 3.7 ha of Sagittaria latifolia.

DISCUSSION

A variety of submersed and emersed vegetation inhabited the study reach in 1985. Four areas contained appreciable amounts of vegetation: below Brandon Road Dam, the side channel at Treats Island, the mouth of the Du Page River, and the confluence of the Des Plaines and Kankakee rivers. The side channel at Treats Island was dominated by emersed vegetation, primarily Sagittaria latifolia and Typha spp. Other areas were dominated by submersed macrophytes, primarily Myriophyllum sp., Potamogeton spp., and Vallisneria americana. Sagittaria latifolia dominated one heavily vegetated area along with several more sparsely vegetated areas, comprising 25% of the total macrophyte community. Submersed macrophytes, including Potamogeton spp., Myriophyllum sp., and V. americana, comprised 63% of the total macrophyte community.

The aquatic macrophyte species present were all typical of riverine systems in temperate climatic zones, and all serve important functions in their lotic environment (Clark et al. 1983, Sparks 1984, Donnermeyer and Smart 1985, Anderson et al. 1986). They produce oxygen, stabilize sediments, and cycle nutrients through the system. They also interact with other biotic components of the system by providing food and habitat for migrating and nesting waterfowl, shelter for fishes, and food and substrate for macroinvertebrates (Sculthorpe 1967, Bennett 1971, Wright et al. 1981, Wiley and Gorden 1984, Barko et al. 1986).

Except for the Mississippi River, quantitative estimates of macrophyte abundance from river systems in temperate areas are limited (Sparks 1984, Donnermeyer and Smart 1985). Standing crop estimates for Potamogeton pectinatus, Vallisneria americana, Potamogeton sp., and Sagittaria latifolia from other studies (Anderson et al. 1986, Donnermeyer and Smart 1985, Clark 1983) fall within the range of values obtained in this study.

Standing crop estimates for Sagittaria latifolia, Typha spp., Potamogeton pectinatus, and Phragmites communis from lentic studies were also similar to estimates in this study (Westlake 1963, Sculthorpe 1967, Wiley and Gorden 1984, Tazik and Wiley 1985). However, other macrophytes, including Potamogeton crispus, Nelumbo lutea, and Ceratophyllum demersum, had considerably lower standing crops than those reported by Moran (1981), Sparks (1984), and Wiley and Gorden (1984).

The general condition of the macrophytes throughout the reach were not noticeably different except that Sagittaria latifolia beds in the side channel by Treats Island were in excellent condition, whereas those beds further upstream (river mile 281-284.5) were in poorer condition. Upstream beds had fewer leaves and plant stems were less rigid and darker in color. These macrophytes inhabited an area much less protected from wave action than the beds near Treats Island and were probably subjected to higher water velocities, increased turbidity, and different water temperatures. Any of these factors could have caused these beds to produce less vigorous growth or to shift the timing of production in the growing season (Westlake 1967, 1973; Haag and Gorham 1977; Grace and Tilly 1978).

Based on water depth and current velocity, two large areas one might expect to be densely vegetated, Grant Creek and the slough at Will County Forest Preserve Island, were instead sparsely vegetated. Sediment conditions may have been one reason why the slough was not vegetated; they were flocculent, loose, and easily disturbed. Such conditions perpetuate high turbidity levels which reduce light penetration. This contributes to the decline of macrophyte populations and inhibits re-establishment as well (Jackson and Starrett 1959, Mills et al. 1966). Loose, unstable sediments also impede establishment and maintenance of submersed aquatic macrophytes by reducing the ability of roots to anchor plants in the substrate (Sculthorpe 1967). However, sediments at the mouth of the Du Page River were very unstable in places, yet supported rooted vegetation. Thus, other factors may be contributing to the lack of vegetation in the slough at Will County Forest Preserve Island.

Sediments in Grant Creek were stable and firm, so sediment stability is not considered a reason for the scarcity of vegetation in this area. Water depth and clarity seemed conducive to vegetation establishment and growth. Lack of vegetation may result from low nutrient levels, poor water quality conditions, or the presence of toxic substances. Possibly habitat conditions had been poor, but have improved so that macrophyte communities were beginning to establish. Additional research is needed to adequately address these questions.

Transect analyses were used to help characterize submersed vegetation where beds were relatively small, somewhat distant from each other, and difficult to distinguish using other ground-truth techniques. During field sampling it was unclear how well defined these beds would be on the aerial photographs.

Below Brandon Road Bridge and at the mouth of the Du Page River, transect data were similar to data resulting from integration of all mapping methods, suggesting transect analyses adequately described the vegetation. However, transect data from the confluence of the Des Plaines and Kankakee rivers did not represent the plant community as well. The floating-leaved Potamogeton sp. was the only macrophyte accurately represented in the transect data. Vallisneria americana and P. pectinatus were over-represented and P. crispus was under-represented. To obtain better species representation, transects must be established at closer intervals. Decreasing the interval between transects increases the number of transects and sample size. Widening belt transects may also be appropriate.

Remote sensing has been used extensively to map aquatic vegetation (Austin 1978, Long 1979, Dardeau 1983, Leonard 1984). Although infrared film is useful for aerial photography of terrestrial vegetation, natural color has proven more useful for defining submersed aquatic vegetation (Austin 1978, Long 1979). Aerial photographs of the Des Plaines study reach were very clear, accurately indicating location and bed size of submersed and emersed vegetation. Often differences between emersed vegetation types and between submersed and floating-leaf vegetation beds were clearly depicted. Remote sensing techniques provide valuable information and should be used in future studies.

During Phase I, an estimate of the quantity and quality of aquatic vegetation was obtained. However, because aquatic plant populations vary seasonally and annually, several consecutive years of study are necessary to accurately describe the status and trends in aquatic vegetation populations. This initial characterization process requires a minimum of 3 years of aerial photograph interpretation and ground-truth verification. Following this initial characterization, a monitoring program can be maintained through annual aerial photograph interpretation and detailed ground-truth verification at 3- to 5-year intervals or whenever marked changes in plant cover or habitat type are detected. This long-term monitoring is conducted at a reduced level of effort and expense.

Because assessing factors limiting aquatic life is an objective of this monitoring program, macrophyte interactions with toxic substances should be assessed. Substances in the environment being accumulated or concentrated by macrophytes should be identified.

SUMMARY

1. Seventeen aquatic vascular macrophyte species were collected from the 21-km study reach of the Des Plaines River in July-August 1985. These macrophytes occupied over 46 ha within the reach and produced an estimated 153,000 kg of biomass.

2. The most heavily vegetated areas were just below Brandon Road Dam (river mile 286-285.3), the side channel by Treats Island (river mile 280-279), the mouth of the Du Page River (river mile 276.5-278), and the confluence of the Des Plaines and Kankakee rivers (river mile 273-273.5). Three areas were dominated by submersed and one by emersed vegetation (Treats Island side channel).

3. Sagittaria latifolia, Potamogeton crispus, Potamogeton pectinatus, and Myriophyllum sp. were the most abundant macrophytes, covering 73% of the total vegetated area.

4. Whole plant standing crop estimates for submersed macrophytes ranged from 12.8 (Ceratophyllum demersum) to 252.7 g dry weight m^{-2} (Myriophyllum sp.). Above ground standing crop estimates for emersed vegetation ranged from 712.4 (Sagittaria latifolia) to 3,612.2 g dry weight m^{-2} (Phragmites communis). Most biomass estimates were comparable to those from other lotic and lentic studies.

5. Condition of Sagittaria latifolia varied within the study reach. Beds between river mile 281 and 284.5 were in poorer condition than beds in other areas, possibly due to higher current velocity, lower water clarity, or different water temperature conditions.

6. Two areas one might expect to be heavily vegetated were only sparsely vegetated. Possible causes include flocculent and unstable sediments, sediment toxicity, and water clarity.

7. The study reach is classified as a Riverine System except for a small area inhabited by Phragmites communis, which is classified in the Persistent Wetland Subclass of the Palustrine System.

8. Low-altitude natural color aerial photographs of the study reach taken in late July 1985 permitted accurate determination of location and bed size of submersed and emersed vegetation. This mapping technique should be used in all future surveys.

RECOMMENDATIONS

1. Vegetation characterization conducted during Phase I (1985) should be continued in Phases II and III (1986 and 1987).

2. Factors that limit aquatic life, including habitat characteristics, sediment toxicity, and boat traffic, should be addressed in Phases II and III.

3. Toxic substance levels in macrophyte tissues, sediments, and water should be determined, and the interactions of these substances with biotic ecosystem components should be addressed.

SECTION 2

MACROINVERTEBRATE COMMUNITIES

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INTRODUCTION

Aquatic macroinvertebrate communities are essential components of freshwater ecosystems because of their roles in the processing and cycling of organic matter and their value as a food resource for higher level consumers including fishes, shore birds, wading birds, and ducks. The composition and structure (relative abundance, taxa richness, and diversity) of these relatively sessile communities are directly influenced by the environmental conditions prevailing during their development. The study of these complexes of organisms is extremely useful in the assessment of the water quality and biological condition of aquatic systems.

Benthic surveys conducted in 1977 by Nalco Environmental Sciences and in 1984 by Ecological Analysts, Inc. were limited in scope to basically two habitat types--main channel and main channel border. Macroinvertebrate communities associated with other aquatic habitat types, such as backwater areas, rapids/riffles, and aquatic macrophyte beds, were not sampled. Also, it is probable that some small macroinvertebrate taxa present in ponar samples collected by Environmental Analysts were lost during processing because 30-mesh (595-µm openings) screening was used to wash samples before they were returned to the laboratory for picking and identification.

The specific objectives of this component of Phase I were to: (1) develop and evaluate sampling methodologies that will adequately characterize macroinvertebrate communities during the Des Plaines River Long-Term Monitoring Program, (2) ascertain the quality of the macroinvertebrate communities currently supported in the study reach of the Des Plaines River by sampling several habitats (including those of the May 1977 and January 1984 studies), and (3) compare the benthic component of the Des Plaines River macroinvertebrate community with that of the Kankakee River, a nearby river of similar size and habitats which joins the Des Plaines to form the Illinois River (Fig. 1, pg. 2), but which does not receive input from the Chicago Sanitary and Ship Canal or commercial navigation traffic.

MATERIALS AND METHODS

SAMPLING SITES

In summer 1985, macroinvertebrate sampling locations were selected to: (1) represent the habitat types characteristic of the reach, and (2) provide comparisons of similar habitat types from different areas of the study reach (Table 9, Fig. 11-14, Appendix A). A total of 13 petite ponar, 2 Surber, and 4 macrophyte samples were processed and analyzed.

The January 1986 resurvey was conducted along the three transects previously sampled (Nalco 1978, Ecological Analysts 1984) to allow for comparisons between the present and preceding studies (Fig. 15). On each transect three samples were collected from each of three sites: midchannel (M), right (facing downstream) channel border (R), and left channel border (L), yielding a total of 27 samples.

SAMPLING GEAR

In summer 1985, benthic macroinvertebrate communities were sampled using standard methods, depending on substrate type (Table 9). Relatively soft-bottomed habitats were sampled with a petite ponar (area sampled = 0.024 m^2) and washed in 300-µm mesh Nitex sieve buckets. Hard-bottom and rocky substrates in shallow water were sampled with a Surber swift-water sampler (area sampled = 0.093 m^2, mesh size = 1050 µm).

Aquatic macroinvertebrates were collected from four species of aquatic macrophytes (one sample per species) using a hand sampler constructed of a 0.60-m long cone of 200-µm mesh cloth, with a wide-mouth quart jar attached to one end and a piece of 15-cm diameter PVC pipe attached to the other end. A portion of the aquatic plant was carefully guided into the open end of the pipe, broken off by hand, and the macroinvertebrates rinsed into the jar.

All samples collected for the January 1986 resurvey were taken using the petite ponar dredge as described above.

PRESERVATION AND LAB METHODS

Samples collected in summer 1985 were preserved in 10% buffered formalin, and those collected in January 1986 were preserved in 10% alcohol and later transferred to 10% buffered formalin. In the laboratory, samples selected for analysis were processed by sucrose flotation to remove inorganic sediments (Anderson 1959). Because previous studies employed a 595-µm sieve to wash samples, samples collected in January 1986 were differentially sieved and only the component retained on 595-µm sieve was analyzed for this report.

Each sample was examined separately under a stereo dissecting microscope with magnification up to 40x. Organisms were

hand-picked from detritus and inorganic material and temporarily stored in 80% ethanol. Prior to identification, Oligochaeta were mounted on slides with Gurr Hydromount and Chironomidae were cleared in 10% KOH and slide-mounted in polyvinyl lactophenol.

Identification of aquatic oligochaetes and chironomids were made using either an Olympus model BH compound microscope with fluorite phase or a Zeiss Standard 14 compound microscope with Nomarski differential interference contrast.

TAXONOMIC PROCEDURES

Taxonomic determinations were then made by systematic specialists using the following taxonomic literature:

Turbellaria, Nematoda, Ectoprocta: Pennak (1978).
Annelida: Brinkhurst and Jamieson (1971); Hiltunen and Klemm (1980); Wetzel et al. (1981); Stimpson et al. (1982); and Brinkhurst (1986) were used in the identification of aquatic oligochaete specimens. Wetzel (1981, 1982a, 1987a); Whitley (1982); and Brinkhurst and Wetzel (1984) provided additional taxonomic and ecological information useful in the collection and study of aquatic Oligochaeta. Nomenclatural information followed Reynolds and Cook (1976; 1981) and Brinkhurst and Wetzel (1984). Klemm et al. (1979); Wetzel et al. (1981); Klemm (1982); and Wetzel (1982b; 1987b) were used in the identification and study of the Hirudinea (leeches).

Both external and internal characteristics were used in the identification of Annelida. Identifications of most tubificids were completed to species level only when specimens were sexually mature. Immature tubificids were classified as unidentifiable immature with capilliform chaetae (UIW/CC) or unidentifiable immature without capilliform chaetae (UIW/OCC). Only anterior fragments of individuals were counted for statistical analyses.

Crustacea: Williams (1972); Page (1974, 1985).
Ephemeroptera: Burks (1953); Edmunds et al. (1976).
Odonata: Hilsenhoff (1975).
Trichoptera: Ross (1944); Wiggins (1977).
Coleoptera: Brigham et al. (1982).
Diptera: Beck and Beck (1969); Hirvenoja (1973); Hilsenhoff (1975); Roback (1977); Soponis (1977); Simpson and Bode (1980); Cranston et al. (1983); Fittkau and Roback (1983); Pinder and Reiss (1983); Coffman and Ferrington (1984).
Gastropoda: Burch (1982).

DATA ANALYSIS AND STATISTICS

Counts of organisms from macrophyte samples (sites 22-25) were not converted to number per unit plant surface area or biomass: these samples were considered qualitative only. Counts

from samples taken with the petite ponar and Surber were converted to number of organisms per square meter. Diversity and evenness values were calculated for each sample using formulas of Shannon (1948) and Pielou (1966), respectively.

Channel sites sampled in summer 1985 were grouped into main channel sites (2, 3, 5, 7, and 9) and side channel sites (10, 12, 13, 15, and 16) for comparison. For data collected January 1986, comparisons were made between individual site means and between transect means. Analysis of variance, followed by Duncan's multiple range procedure, was used to test for significant differences between mean sample counts.

RESULTS AND DISCUSSION

This section includes results and discussions of: (1) the effectiveness of the sampling methods tested in summer 1985, (2) a qualitative comparison of invertebrate faunas collected from different habitats in summer 1985, (3) the Chironomidae and Oligochaeta (the numerically dominant groups), (4) a quantitative comparison of the summer invertebrate fauna of the Des Plaines with that of the relatively clean Kankakee River, (5) a comparison between the 1986 winter benthic survey and previous surveys, (6) what the low taxa diversity values, $\bar{d}$, indicate about water quality, and (7) a note regarding rare and threatened species.

SAMPLING METHODOLOGIES

Standard techniques for collection of macroinvertebrates proved satisfactory with the following exceptions. Where the substrates ranged from large rocks to bedrock, both the petite ponar and standard ponar were usually empty when retrieved. Rocks or cobbles prevented the jaws of the ponar from closing in some areas. Representative macroinvertebrate samples could be collected from these substrates in the future using surface-supplied diving techniques. A diver could recover large rocks or artificial substrates, and attached epibenthos could then be removed and preserved by surface personnel. The diver should also use a downstream net to catch organisms dislodged by disturbance of the substrate. Where bedrock substrates are present, a diver could scrape epifauna into a Surber sampler.

Benthic samples collected by ponar grab were to be processed by elutriation with a device modified from the design of Magdych (1981) to reduce subsequent processing time and loss and destruction of fragile specimens. However, the flocculent nature of the substrate in many samples, possibly caused by the presence of petroleum products in the sediments, prevented efficient use of this device, even though several design modifications were made.

HABITAT SPECIFICITY

Comparisons of macroinvertebrate faunas collected from different habitat types in summer 1985 show that distributions of several groups and species were highly habitat-specific (Tables 10-12). For example, the naidid worm Ophidonais serpentina was only collected from aquatic plants. The introduced Asiatic clam (Corbicula fluminea) was collected only from the main channel in the lower end of the reach near the Will County Forest Preserve Island, and the only live fingernail clam (Sphaerium sp.) was collected in the tailwaters below the Brandon Road Dam.

Analysis of variance indicated significant differences in species evenness ($P < 0.05$) and diversity ($P = 0.055$) between main channel habitat (stations 2, 3, 5, 7, and 9) and channel border habitat (stations 10, 12, 13, 15, and 16) (Table 11).

DOMINANT TAXA: MIDGES (Chironomidae)

The chironomids were the second most abundant organisms collected in the quantitative ponar samples (Table 11). Tanypodine midges of the genera Procladius and Tanypus were most numerous. Both genera are predaceous, free-swimming "sprawlers." Their common foods are immature oligochaetes and smaller chironomids. The midge community from these samples was far from trophically balanced.

Cricotopus bicinctus dominated both the Surber and macrophyte samples (Tables 10 and 12). This species' pollution tolerance is well documented. Cricotopus bicinctus is a tubiculous algavore that has the ability to reproduce rapidly (up to five generations per year) and to colonize disturbed areas quickly. The presence of petroleum products in sediments (as in the Des Plaines River) may promote the growth of algae upon which C. bicinctus feeds (Rosenberg and Weins 1976).

DOMINANT TAXA: WORMS (Annelida)

The oligochaete worms numerically dominated Surber and ponar samples (Tables 11 and 12). Although dipterans dominated the plant samples (Table 10), oligochaetes were present, and one species, Nais variabilis, was abundant on the aquatic macrophyte Potamogeton pectinatus.

In summer 1985, 21 taxa of aquatic annelids were collected from the lower Des Plaines River project area, including 12 taxa of Naididae, 9 taxa of Tubificidae, and 1 taxon of Branchiobdellidae (Tables 10-12). In addition, one immature leech in the family Erpobdellidae was collected.

Branchiobdellidae. The monotypic order Branchiobdellida (Holt 1965) consists of 5 families, 18 recognized genera, and 124 nominal species: of these, 15 genera and 95 species occur in North America (Holt 1986). These worms are known as epizoites, or commensal "parasites" on freshwater Holarctic crustaceans, primarily the astacoidean crayfishes. Other minor hosts include a freshwater crab, freshwater shrimp, cave isopods, the gill chambers of the marine crab Callinectes sapidus, and the freshwater snail Physa sp.

Holt (1974) suggested that branchiobdellids are extremely intolerant to some inorganic pollutants such as coal-mine effluents and sulfates. Blackford (1966) demonstrated the tolerance of these worms to low oxygen concentrations, suggesting the possibility that they are facultative anaerobes.

A generic key to the branchiobdellids is provided by Holt (1978). Specific identification usually requires dissection and/or sectioning. At least one species in the genus Cambarincola was collected from the lower Des Plaines River in summer 1985.

Naididae. Twenty-one genera and 70 nominal species of naidids are known to occur in North America (Brinkhurst 1986).

Seven genera and 12 species of naidids were collected from the lower Des Plaines River in summer 1985 (Tables 10-12).

External morphological features including presence or absence of probosces, eyes, and gills, as well as number, type, and arrangement of chaetae were used for naidid identification. Loden and Harman (1980) discussed chaetotaxy, the problems encountered when chaetae are the primary characters used in identification, and ecophenotypic variation of species populations in relation to chaetal morphology. Elements of the branchial fossa are used to distinguish species within the genus Dero. However, these structures are naturally contractile, with fixation techniques often causing contraction at death. Three species in this genus were collected in summer 1985: Dero (Aulophorus) furcata (Muller), Dero (Dero) digitata (Muller), and Dero (Dero) nivea Aiyer; D. furcata and D. nivea represent new records for this drainage.

Nais communis Piguet and N. variabilis Piguet often can be confused when poorly mounted. Nais pardalis Piguet and N. variabilis often have subtle differences among their chaetae. In summer 1985, four species in the genus Nais were collected: N. barbata Muller, N. communis Piguet, N. pardalis Piguet, and N. variabilis Piguet.

One species of Chaetogaster, C. diaphanus (Gruithuisen), was collected. One additional species, C. cristallinus Vejdovsky, considered by Brinkhurst (1986) to be synonymous with C. diaphanus, was collected by Ecological Analysts in 1984.

Pristina leidyi Smith was the only member of this genus collected from the lower Des Plaines during summer collections. One additional species, P. unidentata Harman, was collected by Nalco in 1977.

Four other naidids were collected during summer sampling: Ophidonais serpentina (Muller), Paranais frici Hrabe, Stephensoniana trivandrana (Aiyer), and Stylaria lacustris (Linnaeus). Ophidonais serpentina was collected only from aquatic plant samples. Stephensoniana trivandrana represents a new record for the Des Plaines River.

Specimens identified only to the familial level of Naididae consisted of individuals lacking clarity due to factors such as presence of a silt-sand tube, numerous incomplete chaetal bundles, or poorly oriented chaetae.

Tubificidae. According to Brinkhurst (1986), 19 genera and 65 nominal species of this family are known to occur in North America. Four genera and eight known species were collected during summer 1985.

The somatic chaetae and morphology of the male genitalia were the primary structures used for species identifications. The species Aulodrilus piguet Kowalewski and Quistadrilus multisetosus (Smith) were identifiable regardless of sexual maturity. Other species in the family Tubificidae collected during this study include: Ilyodrilus templetoni (Southern), Limnodrilus cervix Brinkhurst, Limnodrilus hoffmeisteri Claparede, Limnodrilus maumeensis Brinkhurst and Cook, and Limnodrilus udekemianus Claparede. These species are identifiable only in the sexually

mature state. Immature tubificids were divided into two groups: unidentifiable immature without capilliform chaetae (UIW/OCC), and unidentifiable immature with capilliform chaetae (UIW/CC). Limnodrilus represents the largest and perhaps most complex and controversial genus in this family. Those specimens collected in summer 1985 and identified as Limnodrilus sp. possessed at least part of a penis sheath. Most often the observed character was either underdeveloped or partially obscured by gut content.

Numerous specimens of Limnodrilus collected during this study possessed atypical penis sheaths, a phenomenon reported previously (Brinkhurst 1965, 1975, 1976; Hiltunen 1967, 1969a, 1969b, 1969c, 1973; Kennedy 1969; Howmiller and Beeton 1970; Brinkhurst and Jamieson 1971; Cook and Johnson 1974; Howmiller 1974; Stimpson et al. 1975; Howmiller and Loden 1976; Loden 1977; Maciorowski et al. 1977; Barbour et al. 1979; Spencer 1980; Whitley 1982). Although the morphological and systematic explanations for these variations are still unclear, the general observation has been that occurrence of morphological variations is positively correlated with increasing levels of organic and industrial pollution.

The most common variation in Limnodrilus species observed in previous studies has been an intermediate between L. claparedianus and L. cervix. Limnodrilus claparedianus was not collected from the Des Plaines River during the summer 1985 sampling, nor was it collected during the 1977 study. Ecological Analysts (1984), however, did report this species from the Des Plaines River.

The most common Limnodrilus variant observed during the summer 1985 collections most closely resembled a hybridization of L. cervix and L. maumeensis. Although this variant has not been discussed in the literature, we are sure that this has been seen by others working with benthos from polluted waters.

Limnodrilus hoffmeisteri is the most common tubificid in many aquatic habitats, especially in polluted sites. Indeed, it was the most abundant tubificid in 1977, 1984, and summer 1985 collections. There has been considerable debate about the identity of a number of Limnodrilus species described by Eisen throughout the last century, particularly L. spiralis, also referred to as L. hoffmeisteri form spiralis (see papers listed above). Brinkhurst (1986) and others maintain that some character other than the normal characters used for identification needs to be used to sort out this problem, which may involve polyploidy and hybridization. Stimpson et al. (1982) maintain that the spiralis form is a distinct taxon because of apparent differences in ecological requirements (or tolerances); the spiralis form has been reported from a variety of habitats but generally was found to be most abundant in grossly polluted habitats, often attaining large population densities in the absence of typical L. hoffmeisteri. Many variants of L. hoffmeisteri also were observed in the 1985 collections; only a very few resembled the spiralis form.

Only a few sexually mature specimens of Limnodrilus udekemianus were collected during this study. Kennedy (1969) and others maintain that the distinctive chaetae of this species separate it from all other members of the genus, allowing accurate identification in immature specimens.

FAUNAL COMPARISON OF THE DES PLAINES AND KANKAKEE RIVERS

Previous studies have documented the diverse and relatively unimpacted macroinvertebrate communities of the Kankakee River (Warren 1981). Although the Des Plaines River study area has benthic habitats similar to those of the Kankakee River, the macroinvertebrate communities of the two streams are dissimilar (Table 13). Even though a smaller sieve size (300 µm) was used to process summer 1985 collections from the Des Plaines River than Warren (1981) used on the Kankakee River, far fewer taxa were collected from the Des Plaines. If the same size sieves had been used, differences between the faunas of the two rivers probably would have been even greater.

In large gravel--large cobble substrates of the Kankakee, the tube-building detritivorous heptageniids (Chironomus, Glyptotendipes, and Dicrotendipes) and the epibenthic algavorous hydropsychids (Cricotopus and Orthocladius) were typically abundant. These community components were rare in the Des Plaines: in fact, only a single immature hydropsychid specimen was collected from the entire study area. Predaceous species such as Procladius and Tanypus, typically less abundant in unimpacted streams, dominated the chironomid community of the Des Plaines.

Clearly, factors other than substrate limit the invertebrate fauna in the Des Plaines River. The most likely factors include water quality (dissolved oxygen, toxic contaminants), sediment quality (toxic contaminants attached to suspended or deposited sediment particles), and food quality (toxic contamination or low food value of algae and detritus). Even taxa clearly tolerant of adverse environmental conditions, such as Stenacron, Cheumatopsyche, and Caenis, were absent from the Des Plaines.

Other factors which differ between the two rivers are the amount and type of boat traffic. The Des Plaines study reach is part of the Illinois Waterway and supports commercial barge traffic, while the Kankakee River has shallow rock shelves which limit even recreational craft. Wave wash, prop wash, and the water displaced by moving tows may suspend organisms or disturb their feeding. Resuspension of sediments may dilute the more nutritious seston below levels necessary for efficient processing by organisms and may increase the effects of toxic sediments.

WINTER RESURVEY

In January 1986, the three transects sampled May 1977 by Nalco and January 1984 by Ecological Analysts (Fig. 15) were resurveyed. The mean number of benthic macroinvertebrates collected ranged from 28 m^{-2} (Site 2L, river mile 278) to 14,628 m^{-2} (Site 1M, river mile 284)(Table 14). Transects 1 and 3 had significantly higher mean total organisms ($P = 0.014$) and mean number of taxa ($P = 0.001$) than Transect 2 (Table 15). Three replicate samples at Site 2M produced a mean density of 2,015 m^{-2}. Only two individuals (mean density = 28 m^{-2}) representing two taxa were collected in three petite ponar samples from Site 2L--the

site nearest the Mobil Oil Refinery dock (Appendix B, Tables B4 and B6). A strong petroleum odor was evident in sediments collected from sites 2M and 2L but was not detected in sediments from Site 2R or from transects 1 and 3 (Appendix C).

Of the 40 benthic macroinvertebrate taxa collected January 1986 (Appendix B), 14 had not been reported from these transects in previous studies (Nalco 1978, Ecological Analysts 1984)(Table 16) or from the summer 1985 ponar collections of this study. The new taxa consisted of six naidids (five new genera), an amphipod, a baetid mayfly, an odonate, an unidentifiable trichopteran, and four chironomid taxa. The tubificid Limnodrilus udekemianus was not collected in the January 1986 resurvey even though it was reported in the two earlier surveys and in the summer ponar collections of this study.

Table 17 shows that oligochaetes dominated mean transect densities in 1977, 1984, and 1986. In fact, they accounted for over 90% of the benthos, except for Transect 3 in 1986, when chironomids accounted for 41.2% of the benthic macroinvertebrate community. No trends were apparent when transect means for total benthos were compared among years (Table 17). In 1977, Nalco reported their highest mean density (31,544 m^{-2}) on Transect 3. Ecological Analysts found the highest mean density (9,411 m^{-2}) on Transect 1 in 1984. In 1986, the highest mean transect density was on Transect 3 (12,477 m^{-2}), but the mean for Transect 1 was high as well (11,127 m^{-2}). It is noteworthy that this study identified more macroinvertebrate taxa from each transect than the previous two surveys (Table 17).

Tables 18-20 compare transect site means from 1984 and 1986. These tables do not include 1977 data as only two replicates were taken per sample and no exact location (i.e., mid-channel or channel border) was reported. As with the comparisons of transect means, no trends were apparent.

SPECIES DIVERSITY

Taxa diversity values (Shannon 1948) were calculated for ponar collections of July-August 1985 (Table 11) and January 1986 (Appendix B). In summer, diversity ($\bar{d}$) ranged from a low of 0.79 in a backwater between the Will County Forest Preserve Island and a peninsula (Station 4, Fig. 14) to a high of 2.00 in the discharge channel of the Commonwealth Edison plant (Station 10, Fig. 12). The lowest diversity found in winter 1986 was 0.0 (1 species) near the Mobil Refinery (Site 2L, Fig. 15), and the highest was 2.02 in the mid-channel collection upstream of the confluence of the Des Plaines and Kankakee rivers (Site 3M, Fig. 15).

The equation of Shannon (1948) was used by both Ecological Analysts and INHS to calculate diversity values. However, diversity values recalculated by INHS using Ecological Analysts' 1984 data do not correspond to their reported values, making direct comparisons suspect. Results of calculations using an INHS diversity program have agreed exactly with results from equations in standard biostatistical texts such as Zar (1974). Therefore,

diversity values for Ecological Analysts' data were recalculated using the INHS diversity program (Tables 17-20).

According to Wilhm (1970), diversity in unpolluted waters ranges from 3 to 4, in moderately polluted waters from 1 to 3, and is usually less than 1 in polluted waters. By these criteria, all benthic macroinvertebrate collections from the Des Plaines River during this study and in that of Ecological Analysts (1984) were indicative of polluted to moderately polluted conditions (Tables 17-20, Appendix B).

ENDANGERED AND THREATENED AQUATIC MACROINVERTEBRATES

None of the aquatic macroinvertebrates collected from the study reach of the lower Des Plaines River area in July-August 1985 or January 1986 are listed as federally endangered (USDI 1984a) nor are any currently under consideration for federal listing (USDI 1984b). No official Illinois state list of endangered or threatened species of aquatic macroinvertebrates currently exists.

SUMMARY

1. Comparisons of macroinvertebrate faunas collected from different habitat types in summer 1985 show the distributions of several groups and species were highly habitat-specific.

2. Ponar grabs are inadequate for sampling macroinvertebrate communities of three major habitat types found in the Des Plaines River study reach--substrates composed of bedrock or large cobbles which are often found in main channel and channel border habitats, hard mud substrates in the Brandon Road Dam tailwaters, and aquatic macrophytes.

3. Factors other than habitat limit macroinvertebrate communities in the lower Des Plaines River. Species commonly occurring in the Kankakee River did not occur in similar habitats in the Des Plaines, and some areas within the lower Des Plaines have exceptionally low species diversity and abundance (e.g., site 2L). Suspect agents include toxicants in the water and sediments and disturbance by boat traffic.

RECOMMENDATIONS

1. Evaluation of macroinvertebrate communities from all the major habitat types present in the study reach should be included in a long-term monitoring program. The lower Kankakee River should be monitored as well to provide a clean water reference site.

2. Substrates consisting of bedrock or large cobbles, which often are found in main channel and channel border habitats, should be sampled by divers using modified Hess samplers or surber samplers. These same samplers should be used for macroinvertebrate collections in the tailwaters below Brandon Road Dam. The plant sampling technique described in this report should be used to characterize the distinctive macroinvertebrate communities associated with aquatic macrophytes.

3. Research to determine the factors limiting macroinvertebrate communities in the study reach should be initiated.

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Table 1. Vascular plant taxa in the Des Plaines River, Grundy and Will counties, Illinois, in 1985. Plant growth forms are rooted (R), submersed (S), emersed (E), aquatic (A), terrestrial (T), floating (F), and floating-leaved (FL).

Scientific Name	Common Name	Plant Growth Form
Calamagrostis	Reed bentgrass	R T
Ceratophyllum demersum L.	Coontail	F A
Dianthera americana L.	Water willow	R E A
Eleocharis acicularis (L.)R. & S.	Needle rush	R E A
Elodea canadensis (Michx.)Planchon.	American elodea or waterweed	R S A
Gramineae	Grass family	R T
Myriophyllum sp.	Water milfoil	R S A
Nelumbo lutea (Wild.) Pers.	American lotus	R FL A
Phragmites communis Trin.	Reed grass	R E A
Polygonum sp.	Smartweed	R T
Potamogeton crispus L.	Curlyleaf pondweed	R S A
Potamogeton pectinatus L.	Sago pondweed	R S A
Potamogeton zosteriformis Fernald.	Flatstem pondweed	R S A
Potamogeton sp. (floating-leaved)	Floating-leaved pondweed	R FL A
Sagittaria latifolia L.	Common arrowhead	R E A
Scirpus fluviatilis (Torr.) Gray	River bulrush	R E A
Scirpus validus Vahl.	American bulrush	R E A
Typha angustifolia L.	Narrowleaf cattail	R E A
Typha latifolia L.	Common cattail	R E A
Vallisneria americana (Michx.)	Eelgrass	R S A

Table 2. Relative abundance of macrophyte species in selected segments of the Des Plaines River study reach, Grundy and Will counties, Illinois, during 1985. Values reflect results of transect analyses.

Macrophyte species	RIVER SEGMENTS		
	Brandon Road	Mouth of Du Page River	Confluence of Des Plaines and Kankakee rivers
Ceratophyllum demersum	0.00	0.02	0.00
Vallisneria americana	0.00	0.39	0.33
Myriophyllum sp.	0.19	0.24	0.00
Potamogeton sp.	0.14	0.07	0.03
Potamogeton pectinatus	0.20	0.26	0.31
Potamogeton crispus	0.38	0.02	0.33
Eleocharis acicularis	0.09	0.00	0.00
	1.00	1.00	1.00

Table 3. Aquatic macrophyte cover in the 13-mile Des Plaines River study reach, Grundy and Will counties, Illinois, during 1985. Cover is expressed as a percentage of the total vegetated area and as a percentage of submersed and emersed plant populations. Floating-leaved and floating vegetation are included in the submersed macrophyte totals.

Macrophytes	Cover (ha)	Percentage submersed population	Percentage emersed population	Percentage total population
Submersed				
Ceratophyllum demersum	0.38	1.2	--	0.82
Vallisneria americana	3.70	11.9	--	7.99
Myriophyllum sp.	5.35	17.2	--	11.56
Nelumbo lutea	0.47	1.5	--	1.02
Potamogeton sp.	3.50	11.2	--	7.56
Potamogeton pectinatus	5.74	18.4	--	12.40
Potamogeton crispus	10.72	34.5	--	23.15
Potamogeton zosteriformis	0.26	0.8	--	0.56
Eleocharis acicularis	1.01	3.3	--	2.18
Submersed subtotal	31.13	--	--	--
Emersed				
Typha spp.	3.03	--	20.0	6.54
Sagittaria latifolia	11.88	--	78.3	25.70
Phragmites communis	0.13	--	0.9	0.30
Scirpus spp.	0.11	--	0.7	0.20
Dianthera americana	0.02	--	0.1	0.10
Emersed subtotal	15.17	--	--	--
TOTAL	46.30	100.0	100.0	100.00

Table 4. Coverage (ha) of macrophyte species present in each segment of the Des Plaines River study reach, Grundy and Will counties, Illinois, during 1985. Plant growth forms are submersed (S), emersed (E), floating-leaved (FL), and floating (F).

Macrophyte species	Macrophyte growth forms	STUDY REACH SEGMENTS 1	2	3	4	5	6	7	8	Total area
Ceratophyllum demersum	F	--	--	--	--	0.14	--	0.24	--	0.38
Vallisneria americana	S	--	--	--	0.08	3.57	--	--	0.05	3.70
Myriophyllum sp.	S	2.15	0.07	--	0.14	2.95	0.03	--	0.01	5.35
Nelumbo lutea	FL	--	--	--	--	--	--	0.47	--	0.47
Potamogeton sp.	FL	3.17	0.02	--	--	0.21	0.02	--	0.08	3.50
Potamogeton pectinatus	S	0.97	0.01	--	--	4.48	0.02	--	0.26	5.74
Potamogeton crispus	S	4.79	--	--	--	0.41	--	--	5.52	10.72
Potamogeton zosteriformis	S	0.03	--	--	--	0.20	0.03	--	--	0.26
Eleocharis acicularia	S	1.01	--	--	--	--	--	--	--	1.01
Typha spp.	E	0.08	--	0.30	1.67	0.72	--	0.15	0.11	3.03
Sagittaria latifolia	E	0.83	1.82	1.78	7.10	0.08	0.10	0.09	0.08	11.88
Phragmites communis	E	--	--	0.06	0.07	--	--	--	--	0.13
Scirpus spp.	E	0.11	--	--	--	--	--	--	--	0.11
Dianthera americana	E	--	--	--	--	--	--	--	0.02	0.02
TOTAL		13.14	1.92	2.14	9.06	12.76	0.20	0.97	6.11	46.30

Table 5. Coverage of aquatic macrophytes in segments of the Des Plaines River study reach, Grundy and Will Counties, Illinois, during 1985. Coverage is expressed as a percentage of the total vegetated area. Plant growth forms are submersed (S), emersed (E), floating-leaved (FL), and floating (F).

Macrophyte species	Macrophyte growth forms	STUDY REACH SEGMENTS							
		1	2	3	4	5	6	7	8
Ceratophyllum demersum	F	--	--	--	--	1	--	25	--
Vallisneria americana	S	--	--	--	1	28	--	--	1
Myriophyllum sp.	S	16	4	--	2	23	15	2	1
Nelumbo lutea	FL	--	--	--	--	--	--	48	--
Potamogeton sp.	FL	24	1	--	--	2	10	--	1
Potamogeton pectinatus	S	7	1	--	--	35	10	--	4
Potamogeton crispus	S	36	--	--	--	3	15	--	90
Potamogeton zosteriformis	S	1	--	--	--	1	--	--	--
Eleocharis acicularia	S	8	--	--	--	--	--	--	--
Typha spp.	E	1	--	14	18	6	50	15	2
Sagittaria latifolia	E	6	94	83	78	1	--	9	1
Phragmites communis	E	--	--	3	1	--	--	--	--
Scirpus spp.	E	1	--	--	--	--	--	--	--
Dianthera americana	E	--	--	--	--	--	--	1	--

Table 6. Total surface areas and vegetated areas for study reach segments in the Des Plaines River, Grundy and Will counties, Illinois, in 1985. Number in parentheses is surface area within water boundary lines (see Figures 3-10). Segment 8 does not include area downstream of river mile 273. All measurements are in hectares.

Segment	Surface area of water	Vegetated area			Percentage of surface area vegetated
		Submersed	Emersed	Total	
1	66 (31)	12.12	1.02	13.14	19.9 (35.8)
2	88	0.10	1.82	1.92	2.2
3	78	0.00	2.14	2.14	2.7
4	71 (23)	0.22	8.84	9.06	12.8 (39.4)
5	165 (141)	11.96	0.80	12.76	7.7 (9.0)
6	110	0.10	0.10	0.20	0.2
7	73 (26)	0.71	0.26	0.97	1.3 (3.7)
8	42 (39)	5.92	0.19	6.11	14.5 (15.7)

Table 7. Biomass and cover estimates for aquatic macrophytes in the study reach in the Des Plaines River, Grundy and Will counties, Illinois, in 1985. The submersed group includes floating and floating-leaved vegetation.

Macrophyte species	Number of samples	Biomass: g fresh wt. m^{-2}	Biomass: g dry wt. m^{-2}	Area (ha)	Total kg biomass
Submersed					
Ceratophyllum demersum	3	150.9	12.8	0.38	49
Vallisneria americana	6	4,079.0	195.8	3.70	7,245
Myriophyllum sp.	7	2,340.0	252.7	5.35	13,519
Nelumbo lutea	3	229.9	21.2	0.47	100
Potamogeton sp.	5	715.6	67.3	3.50	2,356
Potamogeton pectinatus	7	701.6	80.0	5.74	4,592
Potamogeton crispus	3	478.4	35.4	10.72	3,795
Potamogeton zosteriformis	7	2,411.6	231.5	0.26	602
			Submersed total		32,258
Emersed					
Typha spp.	4	11,634.8	1,035.5	3.03	31,376
Sagittaria latifolia	15	9,894.8	712.4	11.88	84,633
Phragmites communis	3	11,046.4	3,612.2	0.13	4,696
			Emersed total		120,705
			Total		152,963

Table 8. Classification of the Des Plaines study reach (river mile 273 - 286) according to Cowardin et al. (1979).

SYSTEM	Riverine		Palustrine	
SUBSYSTEM	Upper Perennial, Lower Perennial			
CLASS	Aquatic Bed		Emergent Wetland	Emergent Wetland
SUBCLASS	Rooted Vascular	Floating Vascular	Nonpersistent	Persistent

Table 9. Habitat types and sampling devices used for aquatic macroinvertebrate samples collected from the Des Plaines River study reach, Grundy and Will counties, Illinois, 30 July through 7 August 1985.

Site no.	River mile	Sample date	Habitat type	Water depth	Sampling device
2	277.0	30 July	main channel	1m	ponar
3	277.2	30 July	main channel border	0.3m	ponar
4	275.8	30 July	slough	1m	ponar
5	275.8	30 July	main channel	4.2m	ponar
7	285.2	31 July	main channel border	3.4m	ponar
8	285.1	31 July	main channel	3.8m	ponar
9	284.6	31 July	main channel border	1m	ponar
10	284.6	31 July	side channel	3m	ponar
12	279.8	31 July	side channel border (along *Sagittaria* bed)	1m	ponar
13	279.8	31 July	side channel	1m	ponar
15	279.8	31 July	side channel border (in *Sagittaria* bed)	0.4m	ponar
16	275.8	31 July	side channel	0.4m	ponar
17	274.6	31 July	tributary	0.5m	ponar
20	285.5	2 August	tailwaters/riffle	0.2m	Surber
21	285.5	7 August	tailwaters/riffle	0.3m	Surber
22	274.6	31 July	macrophyte (*Ceratophyllum demersum*)	...	hand sampler
23	285.5	2 August	macrophyte (*Potamogeton crispus*)	...	hand sampler
24	274.6	31 July	macrophyte (*Potamogeton pectinatus*)	...	hand sampler
25	277.2	31 July	macrophyte (*Vallisneria americana*)	0.3m	hand sampler

Table 10. Aquatic macroinvertebrates collected qualitatively during July and August 1985 from the Des Plaines River study area in Will County, Illinois, from four species of aquatic macrophytes.

Macroinvertebrate species	Ceratophyllum demersum	Potamogeton crispus	Potamogeton pectinatus	Vallisneria americana
Aschelminthes				
Cnidaria				
Hydrozoa				
Hydroida				
Hydridae				
Hydra sp.	+++	-	-	-
Platyhelminthes				
Turbellaria				
Tricladida				
Planariidae				
Dugesia sp.	++	+	-	-
Annelida				
Oligochaeta				
Haplotaxida				
Naidiae				
Dero nivea	+	-	-	-
Nais variabilis	-	+	++++	-
* *Ophidonais serpentina*	+	-	-	-
Pristina leidyi	+	+	-	-
Stylaria lacustris	-	+	-	-
Tubificidae				
Aulodrilus pigueti	-	-	+	-
UIW/OCC	+	-	-	-
Hirudinea				
Rhychobdellida				
Glossiphoniidae				
Helobdella stagnalis	+	-	-	-
Arthropoda				
Crustacea				
Amphipoda				
Talitridae				
* *Hyalella azteca*				
Insecta				
Odonata				
Zygoptera				
* Coenagrionidae (immature)	+++	-	-	-
* *Ischnura* sp.	+	-	-	-

Table 10 concluded.

Macroinvertebrate species	Ceratophyllum demersum	Potamogeton crispus	Potamogeton pectinatus	Vallisneria americana
Trichoptera				
Hydropsychidae (immature)	-	+	-	-
Coleoptera				
Gyrinidae				
* *Dineutes* sp.	+	-	-	-
Haliplidae				
* *Peltodytes edentulus*	+	-	-	-
Diptera				
Ceratopogonidae				
Palpomyia complex	+	-	-	-
Chironomidae				
Chironominae				
Chironomini				
* *Endochironomus nigricans*	+	-	-	-
Glyptotendipes sp.	++++	+	+++	-
Parachironomus nr. *alatus*	+	-	++	+
Orthocladiinae				
Cricotopus sp.	+	-	-	-
Cricotopus bicinctus	+	++++	++	++++
* *Cricotopus elegans*	-	-	-	+
Cricotopus sylvestris	+	++	++++	++
Nanocladius sp.	+++	+	+	+

* = taxa collected only from qualitative plant samples, not present in quantitative benthic samples.
\+ = present (less than 5 individuals per sample)
++ = rare (5-20 individuals per sample)
+++ = common (21-50 individuals per sample)
++++ = abundant (more than 51 individuals per sample)

Table 11. Aquatic macroinvertebrates collected by petite ponar during July and August 1985 from the Des Plaines River study area in Will County, Illinois. Numbers per square meter (percent composition) are noted for each taxon.

Taxa	Station 2 Rep. 3	3 Rep. 2	4 Rep. 3	5 Rep. 2	7 Rep. 2	9 Rep. 2	10 Rep. 2	12 Rep. 1	13 Rep. 2	15 Rep. 1	15 Rep. 2	16 Rep. 4	17 Rep. 1
Aschelminthes													
Nematoda (unidentified)	-	-	-	-	42 (0.28)	-	-	-	-	-	-	-	-
Annelida													
Oligochaeta													
Naididae (unidentifiable)	583 (4.14)	42 (0.31)	833 (6.25)	458 (3.14)	208 (1.40)	242 (1.19)	42 (0.27)	458 (0.83)	292 (14.29)	2,167 (1.29)	1,333 (3.71)	542 (3.58)	208 (1.13)
Chaetogaster diaphanus	-	-	-	-	-	-	-	-	-	-	42 (0.12)	-	-
Dero digitata	167 (1.19)	83 (0.62)	83 (0.62)	42 (0.29)	292 (1.96)	42 (0.21)	125 (0.80)	125 (0.23)	250 (12.24)	3,333 (1.99)	1,250 (3.48)	417 (2.76)	42 (0.23)
Dero furcata	-	-	-	-	-	-	167 (1.06)	-	-	-	-	-	-
Nais variabilis	-	-	-	-	-	-	-	-	-	-	42 (0.12)	-	-
Paranais frici	-	-	-	-	-	-	-	-	42 (2.06)	-	-	-	-
Stephensoniana trivandrana	-	-	83 (0.62)	-	-	-	-	-	-	-	- (0.12)	250 (1.65)	
Tubificidae													
Aulodrilus pigueti	-	-	-	42 (0.29)	-	242 (1.19)	167 (1.06)	-	-	-	42 (0.12)	-	-
Ilyodrilus templetoni	333 (2.36)	125 (0.93)	-	167 (1.15)	-	125 (0.61)	250 (1.59)	208 (0.38)	42 (2.06)	1,000 (0.60)	42 (0.12)	42 (0.28)	-

Table 11 continued

Taxa	Station 2 Rep. 3	3 Rep. 2	4 Rep. 3	5 Rep. 2	7 Rep. 2	9 Rep. 2	10 Rep. 2	12 Rep. 1	13 Rep. 2	15 Rep. 1	15 Rep. 2	16 Rep. 4	17 Rep. 1
Limnodrilus sp.[c]	167 (1.19)	42 (0.31)	83 (0.62)	-	-	375 (1.84)	-	42 (0.08)	-	333 (0.20)	42 (0.12)	83 (0.55)	42 (0.23)
Limnodrilus cervix	83 (0.59)	125 (0.93)	-	125 (0.86)	-	208 (1.02)	-	125 (0.23)	-	-	-	83 (0.55)	42 (0.23)
Limnodrilus cervix variant	42 (0.31)	83 (0.62)	83 (0.62)	208 (1.43)	-	1,208 (5.93)	-	1,375 (2.48)	-	167 (0.10)	167 (0.46)	167 (1.10)	42 (0.23)
Limnodrilus hoffmeisteri	208 (1.48)	583 (4.36)	750 (5.63)	875 (6.00)	1,208 (8.12)	2,708 (13.30)	500 (3.19)	2,375 (4.28)	-	6,000 (3.58)	708 (1.97)	750 (4.96)	333 (1.81)
L. hoffmeisteri f. *spiralis*	-	-	-	-	-	83 (0.41)	-	-	-	-	-	-	-
Limnodrilus maumeensis	375 (2.66)	542 (4.05)	-	-	42 (0.28)	-	-	-	-	-	-	375 (2.48)	42 (0.23)
Limnodrilus udekemianus	-	-	-	42 (0.29)	42 (0.28)	42 (0.21)	-	-	-	-	-	-	-
Quistadrilus multisetosus	125 (0.89)	250 (1.87)	-	375 (2.75)	250 (1.68)	-	708 (4.51)	1,750 (3.16)	-	8,667 (5.17)	1,250 (9.48)	-	-
UIW/OCC[a]	6,500 (46.15)	6,042 (45.17)	6,750 (50.63)	9,292 (63.71)	10,125 (68.06)	13,458 (66.11)	9,917 (63.19)	45,250 (81.59)	625 (30.59)	129,001 (76.94)	28,125 (78.21)	8,958 (59.23)	8,750 (47.51)
UIW/CC[b]	1,333 (9.46)	917 (6.86)	500 (3.75)	1,875 (12.86)	2,458 (16.52)	1,542 (7.57)	3,317 (21.41)	3,625 (6.54)	375 (18.36)	16,167 (9.64)	2,542 (7.07)	500 (3.31)	583 (3.17)
Total Oligochaeta	9,916 (70.41)	8,834 (66.04)	9,165 (68.14)	3,501 (92.57)	14,625 (98.31)	20,275 (99.59)	15,193 (96.81)	55,333 (99.77)	1,626 (79.54)	166,835 (99.50)	35,585 (98.95)	12,167 (80.44)	10,084 (54.75)

Table 11 continued

Taxa	Station 2 Rep. 3	3 Rep. 2	4 Rep. 3	5 Rep. 2	7 Rep. 2	9 Rep. 2	10 Rep. 2	12 Rep. 1	13 Rep. 2	15 Rep. 1	15 Rep. 2	16 Rep. 4	17 Rep. 1
Ephemeroptera													
Baetidae													
Callibaetis sp.	-	-	-	-	-	-	-	-	-	-	42 (0.12)	-	-
Diptera													
Chironomidae	-	-	-	-	-	-	-	-	-	-	-	-	42 (0.23)
Tanypodinae	-	-	-	-	-	-	-	-	-	-	-	-	83 (0.45)
Tanypodini													
Tanypus sp.	-	-	-	-	-	-	-	42 (0.08)	-	-	42 (0.12)	-	2,625 (14.25)
Tanypus nr. punctipennis	-	42 (0.31)	-	-	-	-	-	42 (0.08)	-	667 (0.40)	208 (0.58)	83 (0.55)	-
Tanypus stellatus	-	-	-	-	-	-	-	42 (2.06)	-	-	125 (0.83)	1,750 (9.50)	-
Procladiini													
Procladius sp.	4,083 (28.99)	4,500 (33.64)	4,000 (30.00)	1,042 (7.14)	-	-	42 (0.27)	42 (0.08)	333 (16.13)	167 (0.10)	-	2,708 (17.90)	3,167 (17.20)
Coelotanypodini													
Coelotanypus sp.	-	-	-	-	-	-	-	-	-	-	-	-	42 (0.23)

Table 11 continued

Taxa	Station 2 Rep. 3	3 Rep. 2	4 Rep. 3	5 Rep. 2	7 Rep. 2	9 Rep. 2	10 Rep. 2	12 Rep. 1	13 Rep. 2	15 Rep. 1	15 Rep. 2	16 Rep. 4	17 Rep. 1
Chironominae													
Chironomus sp.	-	-	-	-	42 (0.28)	-	42 (0.27)	-	-	-	-	42 (0.28)	-
Cryptochironomus sp.	-	-	-	-	-	-	-	-	-	-	-	-	83 (0.45)
Dicrotendipes sp.	-	-	-	-	42 (0.28)	-	-	-	-	-	-	-	-
Glyptotendipes sp.	-	-	-	-	-	-	-	-	-	-	42 (0.12)	-	-
Microchironomus sp.	-	-	167 (1.25)	-	-	-	-	-	-	-	-	-	542 (2.94)
Polypedilum sp.	-	-	-	-	83 (0.56)	-	-	-	-	-	-	-	-
Orthocladiinae													
Cricotopus bicinctus	42 (0.30)	-	-	-	42 (0.28)	83 (0.41)	250 (1.59)	-	-	-	-	-	-
Cricotopus sylvestris	42 (0.30)	-	-	-	-	-	-	-	42 (2.06)	-	42 (0.12)	-	-
Nanocladius sp.	-	-	-	-	-	-	167 (1.06)	-	-	-	-	-	-
Total Chironomidae	4,167 (29.59)	4,542 (33.96)	4,167 (31.26)	1,042 (7.14)	209 (1.40)	83 (0.41)	501 (3.19)	126 (0.23)	417 (20.41)	834 (0.50)	334 (0.93)	2,958 (19.56)	8,334 (45.25)

Table 11 concluded

Taxa	Station 2 Rep. 3	3 Rep. 2	4 Rep. 3	5 Rep. 2	7 Rep. 2	9 Rep. 2	10 Rep. 2	12 Rep. 1	13 Rep. 2	15 Rep. 1	15 Rep. 2	16 Rep. 4	17 Rep. 1
Mollusca													
Pelecypoda (clams)													
Corbiculidae													
Corbicula fluminea	-	-	-	42 (0.29)	-	-	-	-	-	-	-	-	-
Total # of individuals	14,083	13,376	13,332	14,585	14,876	20,358	15,694	55,459	2,043	167,669	35,961	15,125	18,418
Total taxa	9	8	6	9	10	7	10	7	6	7	12	10	9
Taxa diversity	1.05	1.08	0.79	1.64	1.45	1.08	2.00	1.34	1.37	1.37	1.68	1.55	1.35
Taxa evenness	0.48	0.52	0.44	0.75	0.63	0.55	0.87	0.69	0.77	0.70	0.67	0.67	0.59

[a] = Unidentifiable immature specimens without capilliform chaetae.

[b] = Unidentifiable immature specimens with capilliform chaetae.

[c] = Developing penis sheaths were present in these individuals.

Table 12. Aquatic macroinvertebrates collected by Surber sampler during July and August 1985 from the Des Plaines River study area in Will County, Illinois. Numbers per square meter (percent composition) are noted for each taxon.

Species	Station 20 Replicate 1	Station 21 Replicate 3
Aschelminthes		
Nematoda (unidentified)	2,475 (3.08)	-
Cnidaria		
Hydrazoa		
Hydroida		
Hydridae		
Hydra sp.	269 (0.33)	968 (2.51)
Platyhelminthes		
Turbellaria		
Tricladida		
Planariidae		
Dugesia sp.	3,927 (4.88)	3,013 (7.82)
Rhabdocoela (unidentified)		
Ectoprocta	+	-
Annelida		
Branchiobdellida		
Branchiobdellidae		
Cambarincola sp.	-	753 (1.95)
Oligochaeta		
Haplotaxida		
Naididae	3,764 (4.68)	3,981 (10.33)
Chaetogaster diaphanus	5,377 (6.69)	-
Dero digitata	4,839 (6.02)	-
Dero furcata	-	968 (2.51)
Dero nivea	-	2,475 (6.42)
Nais barbata	-	323 (0.84)
Nais communis	-	646 (1.68)
Nais pardalis	-	1,614 (4.19)
Nais variabilis	4,301 (5.35)	1,722 (4.47)
Pristina leidyi	-	215 (0.56)
Stylaria lacustris	1,075 (1.34)	430 (1.12)
Tubificidae		
Limnodrilus hoffmeisteri	6,452 (8.03)	538 (1.40)
Quistadrilus multisetosus	1,075 (1.34)	-
UIW/OCC *	39,248 (48.82)	1,291 (3.35)
UIW/CC **	-	-
Total Oligochaeta	66,131 (82.26)	14,203 (37.87)
Annelida		
Hirudinea		
Erpobdellidae (unidentified)	-	215 (0.56)

Table 12 continued

Species	Station 20 Replicate 1	Station 21 Replicate 3
Arthropoda		
Crustacea		
Isopoda		
Asellidae		
Asellus sp.	-	10,868 (28.21)
Decapoda		
Cambaridae		
Orconectes virilis	-	215 (0.56)
Insecta		
Ephemeroptera		
Baetis sp.	-	108 (0.28)
Odonata		
Zygoptera		
Coenagrionidae (immature)	-	108 (0.28)
Trichoptera		
Hydropsychidae (immature)	-	108 (0.28)
Hydroptilidae		
Hydroptila sp.	-	108 (0.28)
Coleoptera		
Elmidae		
Stenelmis sp.	54 (0.07)	-
Diptera		
Ceratopogonidae		
Palpomyia group	54 (0.07)	-
Chironomidae		
Tanypodinae		
Pentaneurini		
Thienemannimyia group	-	323 (0.84)
Procladiini		
Procladius sp.	-	108 (0.28)
Chironominae		
Chironomini	-	108 (0.28)
Chironomus sp.	54 (0.07)	-
Dicrotendipes sp.	215 (0.27)	-
Dicrotendipes neomodestus	54 (0.07)	-
Dicrotendipes nervosus Type II	54 (0.07)	215 (0.56)
Parachironomus nr. *monochromus*	108 (0.13)	-
Polypedilum sp.	54 (0.07)	323 (0.84)

Table 12 concluded

Species	Station 20 Replicate 1	Station 21 Replicate 3
Orthocladiinae		
Cricotopus sp.	54 (0.07)	108 (0.28)
Cricotopus bicinctus	5,918 (7.36)	3,658 (9.50)
Cricotopus sylvestris	215 (0.27)	430 (1.12)
Nanocladius sp.	699 (0.87)	538 (1.40)
Orthocladius/Cricotopus	54 (0.07)	-
Total Chironomidae	7,479 (9.30)	5,811 (15.08)
Mollusca		
Gastropoda		
Basommatophora		
Ancylidae		
Ferrissia sp.	-	861 (2.24)
Pelecypoda		
Sphaeriidae (unidentified)	-	1,184 (3.07)
Total number of individuals	80,369	38,523
Total taxa	21	28
Taxa diversity	2.26	2.52
Taxa evenness	0.74	0.75

* = unidentified immature specimens without capilliform chaetae
** = unidentified immature specimens with capilliform chaetae

Table 13. Comparison of the number of key taxonomic or functional groups on natural substrates sampled by ponar grab sampler in the Des Plaines and Kankakee rivers in Illinois.[a]

River	Des Plaines	Kankakee			
Year	1985	1981	1979	1978	1977
No. samples	13	24	24	24	
No. sites	13	8	8	8	8
Total taxa	29	83	79	98	80
Oligochaeta	13	7	8	6	[b]
Ephemeroptera	1	9	9	10	8
Heptaeniidae	0	3	3	3	4
Trichoptera	0	5	4	12	11
Hydropsychidae	0	2	1	1	3
Chironomidae	13	22	16	24	17

[a] Sources: Swadener (1978, 1979, 1980); Warren (1981).
[b] Oligochaeta not identified to species in this study.

Table 14. Mean densities (no. m^{-2}) (±SE) and percent composition of aquatic macroinvertebrates collected from the lower Des Plaines River, Grundy and Will counties, Illinois, 16 January 1986.

Taxa	Sample site																			
	1R		1M		1L		2R		2M		2L		3R		3M		3L	
	no. m^{-2} (%)	±SE	no. m^{-2} (%)	±SE	no. m^{-2} (%)	±SE	no. m^{-2} (%)	±SE	no. m^{-2} (%)	±SE	no. m^{-2} (%)	±SE	no. m^{-2} (%)	±SE	no. m^{-2} (%)	±SE	no. m^{-2} (%)	±SE
Aschelminthes																		
Nematoda	236.3 (1.9)	36.7	55.7 (0.4)	36.7	83.3 (1.3)	63.5	69.3 (0.5)	69.3	0.0		0.0		0.0		14.0 (0.1)	14.0	14.0 (0.1)	14.0
Annelida																		
Oligochaeta																		
Enchytraeidae (unidentifiable)	0.0		14.0 (0.1)	14.0	0.0		0.0		0.0		0.0		0.0		0.0		0.0	
Naididae (unidentifiable)	402.7 (3.3)	50.2	375.0 (2.6)	120.1	153.0 (2.4)	60.5	458.3 (3.6)	354.5	0.0		0.0		42.0 (0.3)	0.0	153.0 (1.3)	132.6	83.3 (0.6)	24.0
Amphichaeta leydigi	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		14.0 (0.1)	14.0
Bratislavia unidentata	0.0		14.0 (0.1)	14.0	0.0		0.0		0.0		0.0		0.0		0.0		0.0	
Dero (unidentifiable)	0.0		83.3 (0.6)	83.3	0.0		0.0		0.0		0.0		14.0 (0.1)	14.0	0.0		0.0	
Dero digitata	0.0		0.0		208.3 (3.2)	105.0	0.0		0.0		0.0		27.7 (0.2)	27.7	0.0		55.7 (0.4)	55.7
Dero furcata	14.0 (0.1)	14.0	41.7 (0.3)	24.0	0.0		0.0		0.0		0.0		0.0		0.0		0.0	
Dero nivea	264.0 (2.1)	201.8	180.7 (1.2)	36.7	69.3 (1.1)	69.3	27.7 (0.2)	27.7	0.0		0.0		14.0 (0.1)	14.0	27.7 (0.2)	27.7	27.7 (0.2)	27.7
Nais (unidentifiable)	55.7 (0.5)	55.7	14.0 (0.1)	14.0	0.0		0.0		0.0		0.0		0.0		0.0		0.0	
Nais barbata	41.7 (0.3)	24.0	0.0		0.0		14.0 (0.1)	14.0	14.0 (0.7)	14.0	0.0		0.0		0.0		0.0	
Nais communis	27.7 (0.2)	27.7	97.3 (0.7)	97.3	0.0		0.0		0.0		0.0		0.0		69.3 (0.6)	69.3	14.0 (0.1)	14.0
Nais pardalis	0.0		27.7 (0.2)	27.7	14.0 (0.2)	14.0	0.0		0.0		0.0		0.0		0.0		0.0	
Nais variabilis	0.0		97.3 (0.7)	97.3	0.0		0.0		14.0 (0.7)	14.0	0.0		0.0		0.0		69.3 (0.5)	36.7
Haemonais waldvogeli	0.0		0.0		0.0		14.0 (0.1)	14.0	0.0		0.0		0.0		0.0		0.0	
Ophidonais serpentina	28.0 (0.2)	14.0	14.0 (0.1)	14.0	0.0		0.0		14.0 (0.7)	14.0	0.0		0.0		14.0 (0.1)	14.0	0.0	

Table 14 continued

Taxa	Sample site																	
	1R		1M		1L		2R		2M		2L		3R		3M		3L	
	no. m^{-2} (%)	+SE	no. m^{-2} (%)	+SE	no. m^{-2} (%)	+SE	no. m^{-2} (%)	+SE	no. m^{-2} (%)	+SE	no. m^{-2} (%)	+SE	no. m^{-2} (%)	+SE	no. m^{-2} (%)	+SE	no. m^{-2} (%)	+SE
Paranais frici	55.7 (0.5)	55.7	41.7 (0.3)	24.0	14.0 (0.2)	14.0	1194.3 (9.3)	580.0	0.0		0.0		55.3 (0.5)	27.7	1278.0 (11.1)	273.7	222.3 (1.6)	97.3
Pristinella osborni	69.7 (0.6)	50.2	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
Slavina appendiculata	0.0		27.7 (0.2)	27.7	0.0		0.0		0.0		0.0		0.0		0.0		0.0	
Stylaria lacustris	0.0		14.0 (0.1)	14.0	0.0		0.0		0.0		0.0		0.0		0.0		0.0	
Tubificidae																		
Autodrilus pigueti	486.3 (3.9)	383.5	1903.0 (13.0)	1311.0	444.7 (6.9)	218.2	847.3 (6.6)	458.1	42.0 (2.1)	0.0	0.0		430.3 (3.5)	27.7	611.0 (5.3)	73.5	1028.0 (7.5)	543.4
Ilyodrilus templetoni	0.0		111.3 (0.8)	55.7	125.3 (2.0)	83.3	500.3 (3.9)	166.7	41.7 (2.1)	24.0	0.0		333.3 (2.7)	127.4	166.7 (1.5)	96.1	458.3 (3.3)	229.7
Limnodrilus (unidentifiable)	97.3 (0.8)	77.3	69.7 (0.5)	50.2	14.0 (0.2)	14.0	83.3 (0.6)	48.2	14.0 (0.7)	14.0	0.0		83.3 (0.7)	24.0	14.0 (0.1)	14.0	41.7 (0.3)	24.0
Limnodrilus cervix	180.3 (1.5)	140.9	125.0 (0.9)	24.2	28.0 (0.4)	14.0	111.0 (0.9)	73.5	97.3 (4.8)	36.8	0.0		194.7 (1.6)	77.3	152.7 (1.3)	69.7	125.0 (0.9)	24.2
Limnodrilus cervix variant	41.7 (0.3)	24.0	27.7 (0.2)	27.7	55.7 (0.9)	36.7	208.3 (1.6)	146.3	111.3 (5.5)	91.1	0.0		28.0 (0.2)	14.0	14.0 (0.1)	14.0	0.0	
Limnodrilus claparedianus	0.0		0.0		0.0		0.0		14.0 (0.1)	14.0	0.0		0.0		0.0		14.0 (0.1)	14.0
Limnodrilus hoffmeisteri	1166.6 (9.5)	502.5	1736.3 (11.9)	160.3	597.3 (9.3)	170.8	1639.0 (12.7)	1014.3	583.0 (28.9)	24.0	0.0		486.0 (4.0)	49.9	819.3 (7.1)	36.7	305.7 (2.2)	84.3
L. hoffmeisteri f. spiralis	0.0		14.0 (0.1)	14.0	14.0 (0.2)	14.0	0.0		14.0 (0.7)	14.0	0.0		14.0 (0.1)	14.0	0.0		0.0	
Limnodrilus maumeensis	0.0		0.0		0.0		0.0		0.0		0.0		14.0 (0.1)	14.0	69.3 (0.6)	36.7	0.0	
Quistadrilus multisetosus	972.0 (7.9)	200.4	778.0 (5.3)	309.3	139.0 (2.2)	14.0	208.3 (1.6)	120.4	14.0 (0.7)	14.0	0.0		777.7 (6.4)	170.8	569.7 (5.0)	50.2	597.0 (4.4)	84.6
Tubifex tubifex	0.0		0.0		27.7 (0.4)	27.7	0.0		0.0		0.0		0.0		0.0		0.0	
UIW/OCC[a]	6152.7 (49.9)	2023.1	6694.3 (45.8)	1638.7	3639.0 (56.7)	1184.2	5416.7 (42.1)	1307.7	819.3 (40.7)	204.8	0.0		2389.0 (19.5)	333.6	4833.3 (42.1)	1027.8	1903.0 (13.9)	273.7
UIW/CC[b]	903.0 (7.3)	382.2	1222.3 (8.4)	540.7	680.7 (10.6)	278.9	1805.3 (14.0)	578.0	222.3 (11.0)	77.3	0.0		666.7 (5.4)	168.4	1638.7 (14.3)	643.8	986.0 (7.2)	97.0

Table 14--continued

Taxa	Sample site																	
	1R		1M		1L		2R		2M		2L		3R		3M		3L	
	no. m^{-2} (%)	+SE	no. m^{-2} (%)	+SE	no. m^{-2} (%)	+SE	no. m^{-2} (%)	+SE	no. m^{-2} (%)	+SE	no. m^{-2} (%)	+SE	no. m^{-2} (%)	+SE	no. m^{-2} (%)	+SE	no. m^{-2} (%)	+SE
Total Oligochaeta	10959.3 (88.8)	3343.7	13724.0 (93.8)	3230.1	6224.0 (97.0)	1421.2	12528.0 (97.3)	2527.4	2015.3 (100.0)	247.2	0.0		5570.0 (45.5)	652.9	10430.7 (90.8)	2020.1	5945.0 (43.5)	193.1
Arthropoda																		
Crustacea																		
Amphipoda																		
Talitridae																		
Hyalella azteca	0.0		0.0		0.0		0.0		0.0		14.0 (50.0)	14.0	0.0		0.0		0.0	
Insecta																		
Ephemeroptera																		
Baetidae																		
Pseudocloeon sp.	0.0		14.0 (0.1)	14.0	0.0		0.0		0.0		0.0		0.0		0.0		0.0	
Odonata																		
Anisoptera																		
Gomphidae																		
Gomphus sp.	0.0		0.0		0.0		14.0 (0.1)	14.0	0.0		0.0		0.0		0.0		0.0	
Trichoptera (unidentifiable)	14.0 (0.1)	14.0	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
Diptera																		
Chironomidae (unidenifiable)	0.0		0.0		0.0		0.0		0.0		0.0		14.0 (0.1)	14.0	0.0		0.0	
Tanypodinae																		
Procladiini																		
Procladius sp.	55.7 (0.5)	63.6	55.7 (0.4)	55.7	0.0		138.7 (1.1)	36.7	0.0		0.0		6652.7 (54.4)	1674.1	903.0 (7.9)	399.9	7680.7 (56.1)	1314.3
Orthocladiinae																		
Cricotopus bicinctus	14.0 (0.1)	14.0	14.0 (0.1)	14.0	0.0		0.0		0.0		0.0		0.0		0.0		27.7 (0.2)	27.7
Cricotopus sylvestris	0.0		14.0 (0.1)	14.0	14.0 (0.2)	14.0	0.0		0.0		0.0		0.0		0.0		0.0	
Nanocladius sp.	27.7 (0.2)	27.7	28.0 (0.2)	14.0	0.0		0.0		0.0		14.0 (50.0)	14.0	0.0		0.0		0.0	
Parakiefferiella sp.	27.7 (0.2)	27.7	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	

Table 14 concluded

Taxa	Sample site 1R no. m^{-2} (%)	±SE	1M no. m^{-2} (%)	±SE	1L no. m^{-2} (%)	±SE	2R no. m^{-2} (%)	±SE	2M no. m^{-2} (%)	±SE	2L no. m^{-2} (%)	±SE	3R no. m^{-2} (%)	±SE	3M no. m^{-2} (%)	±SE	3L no. m^{-2} (%)	±SE
Chironominae																		
Chironomini																		
Chironomus sp.	0.0		14.0 (0.1)	14.0	0.0		0.0		0.0		0.0		0.0		0.0		27.7 (0.2)	27.7
Dicrotendipes nervosus	55.3 (0.4)	27.7	0.0		0.0		0.0		0.0		0.0		0.0		14.0 (0.1)	14.0	0.0	
Parachironomus nr. directus	14.0 (0.1)	14.0	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
Parachironomus nr. monochromus	930.7 (7.5)	389.1	639.0 (4.4)	391.9	83.3 (1.3)	48.2	111.0 (0.9)	49.9	0.0		0.0		0.0		111.0 (1.0)	28.0	0.0	
Polypedilum nr. scalaenum	0.0		14.0 (0.1)	14.0	0.0		0.0				0.0		0.0		0.0		0.0	
Total Chironomidae	1125.0 (9.1)	488.4	778.7 (5.3)	269.6	97.3 (1.5)	36.8	249.7 (1.9)	83.5			14.0 (50.0)	14.0	6666.7 (54.5)	1661.7	1028.0 (8.9)	434.2	7736.0 (56.4)	1311.6
Mollusca																		
Pelecypoda																		
Corbiculidae																		
Corbicula fluminea	0.0		55.3 (0.4)	27.7	14.0 (0.2)	14.0	14.0 (0.1)	14.0	0.0		0.0		0.0		14.0 (0.1)	14.0	14.0 (0.1)	14.0
Mean total organisms	12334.7	3874.0	14627.7	3691.6	6418.0	1387.8	12875.0	2566.5	2015.3	247.2	28.0	14.0	12236.7	1837.3	11486.7	1588.3	13709.0	1480.8
Mean number of taxa	12.7	2.0	14.7	1.3	9.3	0.3	9.7	1.2	5.3	0.9	0.7	0.3	8.0	0.0	10.3	1.2	10.7	0.3
Total taxa	20.0		26.0		14.0		14.0		9.0		2.0		10.0		15.0		17.0	
Mean sample diversity	1.86	0.13	1.80	0.04	1.84	0.06	1.59	0.24	1.08	0.11	0.00	0.00	1.05	0.20	1.88	0.10	1.08	0.05
Mean sample eveness	0.74	0.02	0.67	0.04	0.82	0.02	0.70	0.08	0.66	0.04	0.00	0.00	0.50	0.09	0.81	0.02	0.46	0.03

[a] = unidentifiable immatures without capilliform chaetae

[b] = unidentifiable immatures with capilliform chaetae

Table 15. Transect summary of densities (no. m^{-2}) (±SE) and percentages of aquatic macroinvertebrates collected by petite ponar dredge from the lower Des Plaines River, on 16 January 1986.

Taxa	Transect 1 (RM284) no. m^{-2} (%)	±SE	Transect 2 (RM278) no. m^{-2} (%)	±SE	Transect 3 (RM273.5) no. m^{-2} (%)	±SE
Aschelminthes						
Nematoda	125.1 (1.1)	36.7	23.1 (0.5)	23.1	9.3 (0.1)	6.2
Annelida						
Oligochaeta						
Enchytraeidae (unidentifiable)	4.7 *	4.7	0.0 (0.0)	0.0	0.0 (0.0)	0.0
Naididae (unidentifiable)	310.2 (2.8)	57.2	152.8 (3.1)	127.8	92.8 (0.7)	42.1
Amphichaeta leydigi	0.0 (0.0)	0.0	0.0 (0.0)	0.0	4.7 *	4.7
Bratislavia unidentata	4.7 *	4.7	0.0 (0.0)	0.0	0.0 (0.0)	0.0
Dero (unidentifiable)	27.8 (0.2)	27.8	0.0 (0.0)	0.0	4.7 *	4.7
Dero digitata	69.4 (0.6)	46.1	0.0 (0.0)	0.0	27.8 (0.2)	19.7
Dero furcata	18.6 (0.2)	10.1	0.0 (0.0)	0.0	0.0 (0.0)	0.0
Dero nivea	171.3 (1.5)	68.6	9.2 (0.2)	9.2	23.1 (0.2)	12.2
Nais (unidentifiable)	23.2 (0.2)	18.6	0.0 (0.0)	0.0	0.0 (0.0)	0.0
Nais barbata	13.9 (0.1)	9.8	9.3 (0.2)	6.2	0.0 (0.0)	0.0
Nais communis	41.7 (0.4)	32.6	0.0 (0.0)	0.0	27.8 (0.2)	23.0
Nais pardalis	13.9 (0.1)	9.8	0.0 (0.0)	0.0	0.0 (0.0)	0.0

Table 15 continued

Taxa	Transect 1 (RM284) no. m^{-2} (%)	±SE	Transect 2 (RM278) no. m^{-2} (%)	±SE	Transect 3 (RM273.5) no. m^{-2} (%)	±SE
Nais variabilis	32.4 (0.3)	32.4	4.7 (0.1)	4.7	23.1 (0.2)	15.7
Haemonais waldvogeli	0.0 (0.0)	0.0	4.7 (0.1)	4.7	0.0 (0.0)	0.0
Ophidonais serpentina	14.0 (0.1)	7.0	4.7 (0.1)	4.7	4.7 *	4.7
Paranais frici	37.1 (0.3)	19.0	398.1 (8.0)	260.1	518.5 (4.2)	209.1
Pristinella osborni	23.2 (0.2)	18.6	0.0 (0.0)	0.0	0.0 (0.0)	0.0
Slavina appendiculata	9.2 (0.1)	9.2	0.0 (0.0)	0.0	0.0 (0.0)	0.0
Stylaria lacustris	4.7 *	4.7	0.0 (0.0)	0.0	0.0 (0.0)	0.0
Tubificidae						
Aulodrilus pigueti	944.7 (8.5)	465.7	296.4 (6.0)	191.0	689.8 (5.5)	181.5
Ilyodrilus templetoni	78.9 (0.7)	35.1	180.7 (3.6)	93.7	319.4 (2.6)	91.1
Limnodrilus (unidentifiable)	60.3 (0.5)	29.6	32.4 (0.7)	19.4	46.3 (0.4)	14.6
Limnodrilus cervix	111.1 (1.0)	47.1	69.4 (1.4)	29.5	157.5 (1.3)	32.5
Limnodrilus cervix variant	41.7 (0.4)	15.6	106.6 (2.1)	58.2	14.0 (0.1)	7.0
Limnodrilus clapardeianus	0.0 (0.0)	0.0	4.7 (0.1)	4.7	4.7 *	4.7
Limnodrilus hoffmeisteri	1166.7 (10.5)	229.4	740.8 (14.9)	378.5	537.0 (4.3)	81.1
L. hoffmeisteri f. spiralis	9.3 (0.1)	6.2	4.7 (0.1)	4.7	4.7 *	4.7

Table 15 continued

Taxa	Transect 1 (RM284) no. m^{-2} (%)	±SE	Transect 2 (RM278) no. m^{-2} (%)	±SE	Transect 3 (RM273.5) no. m^{-2} (%)	±SE
Limnodrilus maumeensis	0.0 (0.0)	0.0	0.0 (0.0)	0.0	27.8 (0.2)	15.5
Quistadrilus multisetosus	629.7 (5.7)	164.8	74.1 (1.5)	48.5	648.1 (5.2)	65.6
Tubifex tubifex	9.2 (0.1)	9.2	0.0 (0.0)	0.0	0.0 (0.0)	0.0
UIW/OCC[a]	5495.3 (49.4)	950.4	2078.7 (41.8)	925.4	3041.8 (24.4)	555.9
UIW/CC[b]	935.3 (8.4)	221.8	675.9 (13.6)	330.3	1097.0 (8.8)	241.1
Total Oligochaeta	10302.4 (92.6)	1780.0	4847.8 (97.5)	2075.7	7315.2 (58.6)	994.1
Arthropoda						
Crustacea						
Amphipoda						
Talitridae						
Hyalella azteca	0.0 (0.0)	0.0	4.7 (0.1)	4.7	0.0 (0.0)	0.0
Insecta						
Ephemeroptera						
Baetidae						
Pseudocloeon sp.	4.7 *	4.7	0.0 (0.0)	0.0	0.0 (0.0)	0.0
Odonata						
Anisoptera						
Gomphidae						
Gomphus sp.	0.0 (0.0)	0.0	4.7 (0.1)	4.7	0.0 (0.0)	0.0

Table 15 continued

Taxa	Transect 1 (RM284) no. m^{-2} (%)	±SE	Transect 2 (RM278) no. m^{-2} (%)	±SE	Transect 3 (RM273.5) no. m^{-2} (%)	±SE
Trichoptera (unidentifiable)	4.7 *	4.7	0.0 (0.0)	0.0	0.0 (0.0)	0.0
Diptera						
Chironomidae (unidentifiable)	0.0 (0.0)	0.0	0.0 (0.0)	0.0	4.7 *	4.7
Tanypodinae						
Procladiini						
Procladius sp.	37.1 (0.3)	21.4	46.2 (0.9)	25.4	5078.8 (40.7)	1225.8
Orthocladiinae						
Cricotopus bicinctus	9.3 (0.1)	6.2	0.0 (0.0)	0.0	9.2 (0.1)	9.2
Cricotopus sylvestris	9.3 (0.1)	6.2	0.0 (0.0)	0.0	0.0 (0.0)	0.0
Nanocladius sp.	18.6 (0.2)	10.1	4.7 (0.1)	4.7	0.0 (0.0)	0.0
Parakiefferiella sp.	9.2 (0.1)	9.2	0.0 (0.0)	0.0	0.0 (0.0)	0.0
Chironominae						
Chironomini						
Chironomus sp.	4.7 *	4.7	0.0 (0.0)	0.0	9.2 (0.1)	9.2
Dicrotendipes nervosus	18.4 (0.2)	12.2	0.0 (0.0)	0.0	4.7 *	4.7
Parachironomus nr. *directus*	4.7 *	4.7	0.0 (0.0)	0.0	0.0 (0.0)	0.0
Parachironomus nr. *monochromus*	551.0 (5.0)	202.6	37.0 (0.7)	23.5	37.0 (0.3)	20.2
Polypedilum nr. *scalaenum*	4.7 *	4.7	0.0 (0.0)	0.0	0.0 (0.0)	0.0

Table 15 concluded

Taxa	Transect 1 (RM284) no. m^{-2} (%)	±SE	Transect 2 (RM278) no. m^{-2} (%)	±SE	Transect 3 (RM273.5) no. m^{-2} (%)	±SE
Total Chironomidae	667.0 (6.0)	246.9	87.9 (1.8)	43.0	5143.6 (41.2)	1213.1
Mollusca						
Pelecypoda						
Corbiculidae						
Corbicula fluminea	23.1 (0.2)	12.2	4.7 (0.1)	4.7	9.3 (0.1)	6.2
Mean total organisms	11127.0	2010.5	4972.8	2130.5	12477.4	883.6
Mean number of taxa	12.2	1.1	5.2	1.4	9.7	0.6
Total taxa	33.0		19.0		21.0	
Mean sample diversity	1.83	0.05	0.89	0.25	1.33	0.15
Mean sample evenness	0.75	0.03	0.45	0.12	0.59	0.06

* = less than 0.1 percent composition

[a] = unidentifiable immatures without capilliform chaetae

[b] = unidentifiable immatures with capilliform chaetae

Table 16. Comparison of the taxonomic compositions of the 1977, 1984, and 1986 aquatic macroinvertebrate collections from three sampling transects on the lower Des Plaines River.

Taxa	May 1977[1]	Jan 1984[2]	Jan 1986
Platyhelminthes			
Turbellaria			
Planariidae			
Dugesia sp. Girard	a	p	a
Rhabdocoela	p	a	a
Aschelminthes			
Nematoda	p	p	p
Ectoprocta			
Plumatella repens Linnaeus	p	a	a
Entoprocta			
Urnatella gracilis Leidy	p	a	a
Annelida			
Oligochaeta			
Enchytraeidae (unidentifiable)	p	p	p
Naididae (unidentifiable)	a	a	p
Amphichaeta leydigi Tauber	a	a	p
Bratislavia unidentata (Harman)	p	a	p
Chaetogaster cristallinus Vejdovsky	a	p	a
Chaetogaster diaphanus (Gruithuisen)	a	a	a
Dero sp. Oken (unidentifiable)	a	a	p
Dero digitata (Muller)	p	p	p
Dero furcata (Muller)	a	a	p

Table 16 continued

Taxa	May 1977[1]	Jan 1984[2]	Jan 1985
Dero nivea (Aiyer)	a	a	p
Haemonais waldvogeli Bretscher	a	a	p
Nais sp. Muller (unidentifiable)	p	a	p
Nais barbata Muller	p	a	p
Nais communis Piguet	a	p	p
Nais pardalis Piguet	a	p	p
Nais variabilis Piguet	a	p	p
Ophidonais serpentina (Muller)	a	a	p
Paranais frici Hrabe (= Wapsa mobilis Liang)	p	p	p
Pristinella osborni (Walton)	a	a	p
Slavina appendiculata (d'Udekem)	a	p	p
Stephensoniana trivandrana (Aiyer)	a	a	a
Stylaria lacustris (Linnaeus)	a	a	p
Tubificidae			
Aulodrilus pigueti Kowalewski	p	p	p
Ilyodrilus templetoni (Southern)	p	p	p
Limnodrilus spp.	a	a	p
Limnodrilus cervix Brinkhurst	p	p	p
Limnodrilus cervix variant	a	a	p
Limnodrilus claparedianus Ratzel	a	p	p
Limnodrilus hoffmeisteri Claparede	p	p	p
L. hoffmeisteri f. spiralis	p	a	p
Limnodrilus maumeensis Brinkhurst & Cook	a	p	p

Table 16 continued

Taxa	May 1977[1]	Jan 1984[2]	Jan 1986
Limnodrilus udekemianus Claparede	p	p	a
Quistadrilus multisetosus (Smith)	p	p	p
Tubifex tubifex (Muller)	a	p	p
Arthropoda			
Crustacea			
Amphipoda			
Talitridae			
Hyalella azteca (Saussure)	a	a	p
Insecta			
Ephemeroptera			
Baetidae			
Callibaetis sp. Eaton	a	a	a
Pseudocloeon sp. Klapalek	a	a	p
Odonata			
Anisoptera			
Gomphidae			
Gomphus sp. Leach	a	a	p
Trichoptera (unidentifiable)	a	a	p
Diptera			
Chaoboridae			
Chaoborus punctipennis (Say)	p	a	a
Chironomidae			
Tanypodinae			
Coelotanypodini			
Coelotanypus sp. Kieffer	a	a	a

Table 16 continued

Taxa	May 1977[1]	Jan 1984[2]	Jan 1986
Procladiini			
Procladius sp. Skuse	p	p	p
Tanypodini			
Tanypus sp. Meigen	p	a	a
Tanypus nr. punctipennis Meigen	a	a	a
Tanypus stellatus Coquillett	a	a	a
Orthocladiinae			
Cricotopus bicinctus Meigen	a	a	p
Cricotopus sylvestris Fabricius	a	a	p
Nanocladius sp. Kieffer	a	a	p
Parakiefferiella sp. Thienemann	a	a	p
Chironominae			
Chironomini			
Chironomus sp. Meigen	a	a	p
Cryptochironomus sp. Kieffer	a	a	a
Dicrotendipes sp. Kieffer	a	a	a
Dicrotendipes neomodestus (Malloch)	a	p	a
Dicrotendipes nervosus (Staeger)	a	p	p
Glyptotendipes sp. Kieffer	a	a	a
Microchironomus sp. Pagast	a	a	a
Parachironomus nr. abortivus (Malloch)	a	p	a
Parachironomus nr. directus (Dendy & Sublette)	a	a	p
Parachironomus nr. monochromus (Wulp)	a	a	p

Table 16 concluded

Taxa	May 1977[1]	Jan 1984[2]	Jan 1986
Polypedilum sp. Kieffer	a	a	a
Polypedilum nr. *scalaenum* (Schrank)	a	a	p
Mollusca			
Gastropoda			
Ancylidae			
Ferrissia sp. Walker	a	p	a
Pelecypoda			
Corbiculidae			
Corbicula fluminea (Muller)	a	a	p
Sphaeriidae			
Musculium transversum (Say)	a	p	a
Total taxa	18	25	40
Oligochaeta taxa	10	17	24
Chironomidae taxa	2	4	10

p = taxon present in collections

a = taxon absent from collections

[1]May 1977 collections by Nalco Environmental Sciences (1978)

[2]Jan 1984 collections by Ecological Analysts (1984)

Table 17. Comparison of mean densities (no. m^{-2}) and percent composition of the dominant (>5.0%) benthic macroinvertebrates collected from the Des Plaines River study site, Will county, Illinois, on May 1977, January 1984, and January 1986.

	Transect 1 (RM284)						Transect 2 (RM278)						Transect 3 (RM273.5)					
	May 1977		Jan 1984		Jan 1986		May 1977		Jan 1984		Jan 1986		May 1977		Jan 1984		Jan 1986	
Taxa	no. m^{-2}	%	no. m^{-2}	%	no. m^{-2}	%	no. m^{-2}	%	no. m^{-2}	%	no. m^{-2}	%	no. m^{-2}	%	no. m^{-2}	%	no. m^{-2}	%
Annelida																		
Oligochaeta																		
Naididae																		
Dero digitata	346	7.1	808	8.6	-	-	368	3.0	144	2.3	-	-	909	2.9	87	1.5	-	-
Nais pardalis	-	-	411	4.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Paranais frici	-	-	-	-	37	0.3	-	-	-	-	398	8.0	-	-	-	-	518	4.2
Total Naididae	714	14.7	1,357	14.4	815	7.3	411	3.3	209	3.4	583	11.7	931	3.0	87	1.5	727	5.8
Tubificidae																		
Aulodrilus pigueti	195	4.0	1,985	21.1	945	8.5	195	1.6	123	2.0	296	6.0	368	1.2	383	6.6	690	5.5
Ilodrilus templetoni	152	3.1	159	1.7	-	-	953	7.6	94	1.5	-	-	1104	3.5	195	3.4	-	-
Limnodrilus cervix	-	-	989	10.5	-	-	411	3.3	534	8.6	-	-	260	0.8	592	10.3	-	-
Limnodrilus hoffmeisteri	2,317	47.6	917	9.7	1,176	10.6	2,750	22.0	989	15.9	746	15.0	3,226	10.2	743	12.9	542	4.3
UIW/OCC[a]	1,104	22.7	2,454	26.1	5,495	49.4	5,867	47.0	3,486	55.9	2,079	41.8	18,619	59.0	2,908	50.4	3,042	24.4
UIW/CC[b]	173	3.6	195	2.1	935	8.4	1,321	10.6	303	4.9	676	13.6	5,629	17.8	159	2.8	1,097	8.8
Total Tubificidae	4,092	84.0	7,866	83.6	9,482	85.2	12,037	96.5	5,982	95.9	4,264	85.8	30,591	97.0	5,355	92.9	6,588	52.8
Total Oligochaeta	4,806	98.7	9,223	98.0	10,302	92.6	12,448	99.8	6,191	99.3	4,848	97.5	31,522	100.0	5,442	94.4	7,315	58.6
Arthopoda																		
Insecta																		
Diptera																		
Chironomidae																		
Tanypodinae																		
Procladius sp.	-	-	-	-	37	0.3	-	-	-	-	46	0.9	-	-	-	-	5,079	40.7
Total Chironomidae	-	-	43	0.5	667	6.0	-	-	36	0.6	88	1.8	22	<0.1	310	5.4	5,144	41.2
Mean total benthos	4,871		9,411		11,127		12,470		6,235		4,973		31,544		5,766		12,477	
Total taxa	6		21		33		8		14		19		7		17		21	
Mean species diversity			1.7		1.83				1.54		0.89				1.7		1.33	

- = taxon accounts for less than 5.0% of the total benthos

a = unidentifiable immatures without capilliform chaetae

b = unidentifiable immatures with capilliform chaetae

Table 18. Comparison of mean densities (no. m^{-2}) and percent composition of the dominant (>5.0%) benthic macroinvertebrates collected from Transect 1 (RM284) of the Des Plaines River study site, Will County, Illinois, during January 1984 and January 1986.

	Station 1R				Station 1M				Station 1L			
	Jan 1984		Jan 1986		Jan 1984		Jan 1986		Jan 1984		Jan 1986	
Taxa	no. m^{-2}	%	no. m^{-2}	%	no. m^{-2}	%	no. m^{-2}	%	no. m^{-2}	%	no. m^{-2}	%
Annelida												
Oligochaeta												
Naididae												
Dero digitata	1,342	10.8	-	-	736	6.4	-	-	346	7.9	-	-
Nais pardalis	650	5.2	-	-	-	-	-	-	584	13.4	-	-
Paranais frici	-	-	56	0.5	-	-	42	0.3	-	-	14	0.2
Total Naididae	2,252	18.2	959	7.8	736	6.4	1,028	7.0	1,082	24.8	459	7.2
Tubificidae												
Aulodrilus pigueti	3,464	28.0	486	3.9	2,122	18.5	1,903	13.0	368	8.4	445	6.9
Limnodrilus cervix	909	7.3	-	-	1,061	9.3	-	-	996	22.8	-	-
Limnodrilus hoffmeisteri	520	4.2	1,167	9.5	1,905	16.6	1,750	12.0	325	7.4	611	9.5
Limnodrilus udekemianus	173	1.4	-	-	1,169	10.2	-	-	173	4.0	-	-
Quistadrilus multisetosus	563	4.6	972	7.9	1,147	10.0	778	5.3	130	3.0	139	2.2
UIW/OCC[a]	2,944	23.8	6,153	49.9	3,204	27.9	6,694	45.8	1,212	27.7	3,639	56.7
UIW/CC[b]	476	3.9	903	7.3	108	0.9	1,222	8.4	-	-	681	10.6
Total Tubificidae	9,656	78.0	10,000	81.1	10,717	93.4	12,682	86.7	3,226	73.8	5,765	89.8
Total Oligochaeta	11,908	96.2	10,959	88.8	11,453	99.8	13,724	93.8	4,308	98.6	6,224	97.0
Arthopoda												
Insecta												
Diptera												
Chironomidae												
Tanypodinae												
Procladius sp.	43	0.4	56	0.5	-	-	56	0.5	22	0.5	-	-
Total Chironomidae	87	0.7	1,125	9.1	-	-	779	5.3	43	1.0	97	1.5
Mean total benthos	12,384		12,335		11,474		14,628		4,373		6,419	
Total taxa	19		20		9		26		15		14	
Mean species diversity	1.91		1.86		1.61		1.8		1.58		1.84	

- = taxon accounts for less than 5.0% of total benthos

a = unidentifiable immatures without capilliform chaetae

b = unidentifiable immatures with capilliform chaetae

Table 19. Comparison of mean densities (no. m^{-2}) and percent composition of the dominant (>5.0%) benthic macroinvertebrates collected from Transect 1 (RM278) of the Des Plaines River study site, Will County, Illinois, during January 1984 and January 1986.

	Station 2R				Station 2M				Station 2L			
	Jan 1984		Jan 1986		Jan 1984		Jan 1986		Jan 1984		Jan 1986	
Taxa	no. m^{-2}	%	no. m^{-2}	%	no. m^{-2}	%	no. m^{-2}	%	no. m^{-2}	%	no. m^{-2}	%
Annelida												
Oligochaeta												
Naididae												
Dero digitata	152	2.2	-	-	22	0.5	-	-	260	3.5	-	-
Nais pardalis	-	-	-	-	-	-	-	-	-	-	-	-
Paranais frici	-	-	1,194	9.3	-	-	-	-	-	-	-	-
Total Naididae	216	3.2	1,708	13.3	43	1.0	42	2.1	368	4.9	-	-
Tubificidae												
Aulodrilus pigueti	281	4.2	847	6.6	22	0.5	42	2.1	65	0.9	-	-
Limnodrilus cervix	195	2.9	-	-	758	17.0	-	-	650	8.7	-	-
Limnodrilus hoffmeisteri	1,299	19.2	1,639	12.7	844	18.9	597	29.6	823	11.0	-	-
Limnodrilus udekemianus	87	1.3	-	-	282	6.3	-	-	195	2.6	-	-
UIW/OCC[a]	3,832	56.7	5,417	42.1	2,057	46.1	819	40.7	4,568	61.0	-	-
UIW/CC[b]	303	4.5	1,805	14.0	130	2.9	222	11.0	476	6.4	-	-
Total Tubificidae	6,517	96.5	10,820	84.0	4,330	97.1	1,972	97.9	7,101	94.8	-	-
Total Oligochaeta	6,733	99.7	12,528	97.3	4,373	98.0	2,015	100.0	7,469	99.7	-	-
Arthopoda												
Insecta												
Diptera												
Chironomidae												
Tanypodinae												
Procladius sp.	-	-	139	1.1	65	1.5	-	-	22	0.3	-	-
Total Chironomidae	-	-	250	1.9	87	1.9	-	-	22	0.3	14	50.0
Mean total benthos	6,755		12,875		4,460		2,015		7,491		28	
Total taxa	11		14		12		9		11		2	
Mean species diversity	1.44		1.59		1.48		1.08		1.7		0.0	

- = taxon accounts for less than 5.0% of total benthos

a = unidentifiable immatures without capilliform chaetae

b = unidentifiable immatures with capilliform chaetae

Table 20. Comparison of mean densities (no. m^{-2}) and percent composition of the dominant (>5.0%) benthic macroinvertebrates collected from Transect 3 (RM273.5) of the Des Plaines River study site, Will County, Illinois, during January 1984 and January 1986.

	Station 3R				Station 3M				Station 3L			
	Jan 1984		Jan 1986		Jan 1984		Jan 1986		Jan 1984		Jan 1986	
Taxa	no. m^{-2}	%	no. m^{-2}	%	no. m^{-2}	%	no. m^{-2}	%	no. m^{-2}	%	no. m^{-2}	%
Annelida												
Oligochaeta												
Naididae												
Dero digitata	43	0.7	-	-	216	3.5	-	-	-	-	-	-
Nais pardalis	-	-	-	-	-	-	-	-	-	-	-	-
Paranais frici	-	-	55	0.5	-	-	1,278	11.1	-	-	222	1.6
Total Naididae	43	0.7	153	1.2	216	3.5	1,542	13.4	-	-	486	3.5
Tubificidae												
Aulodrilus pigueti	650	11.0	430	3.5	43	0.7	611	5.3	455	8.6	1,028	7.5
Limnodrilus cervix	368	6.3	-	-	909	14.8	-	-	498	9.5	-	-
Limnodrilus hoffmeisteri	303	5.2	500	4.1	1,429	23.2	819	7.1	498	9.5	306	2.2
Limnodrilus udekemianus	-	-	-	-	195	3.2	-	-	-	-	-	-
Quistadrilus multisetosus	108	1.8	778	6.4	498	8.1	570	5.0	130	2.5	597	4.4
UIW/OCC[a]	3,421	58.1	2,389	19.5	2,273	37.0	4,833	42.1	3,031	57.6	1,903	13.9
UIW/CC[b]	130	2.2	667	5.4	173	2.8	1,639	14.3	173	3.3	986	7.2
Total Tubificidae	5,261	89.3	5,417	44.3	5,759	93.6	8,889	77.4	5,044	95.9	5,459	39.8
Total Oligochaeta	5,304	90.0	5,570	45.5	5,975	97.1	10,431	90.8	5,044	95.9	5,945	43.4
Arthopoda												
Insecta												
Diptera												
Chironomidae												
Tanypodinae												
Procladius sp.	584	9.9	6,653	54.4	43	0.7	903	7.9	216	4.1	7,681	56.0
Total Chironomidae	584	9.9	6,667	54.5	130	2.1	1,028	8.9	216	4.1	7,736	56.4
Mean Total Benthos	5,889		12,237		6,149		11,487		5,261		13,709	
Total Taxa	9		10		15		15		10		17	
Mean Species Diversity	1.69		1.05		1.67		1.88		1.73		1.08	

- = taxon accounts for less than 5.0% of total benthos

a = unidentifiable immatures without capilliform chaetae

b = unidentifiable immatures with capilliform chaetae

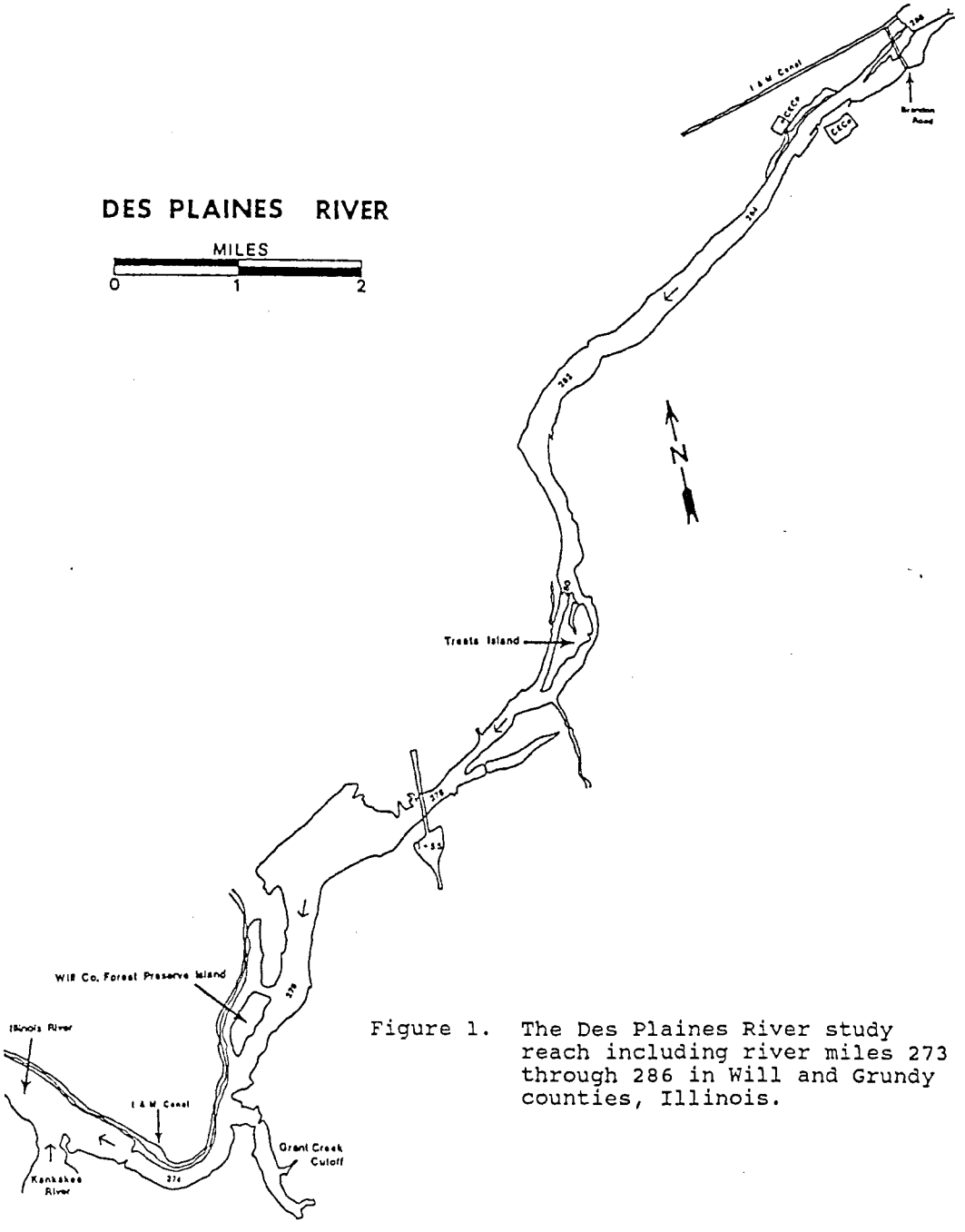

Figure 1. The Des Plaines River study reach including river miles 273 through 286 in Will and Grundy counties, Illinois.

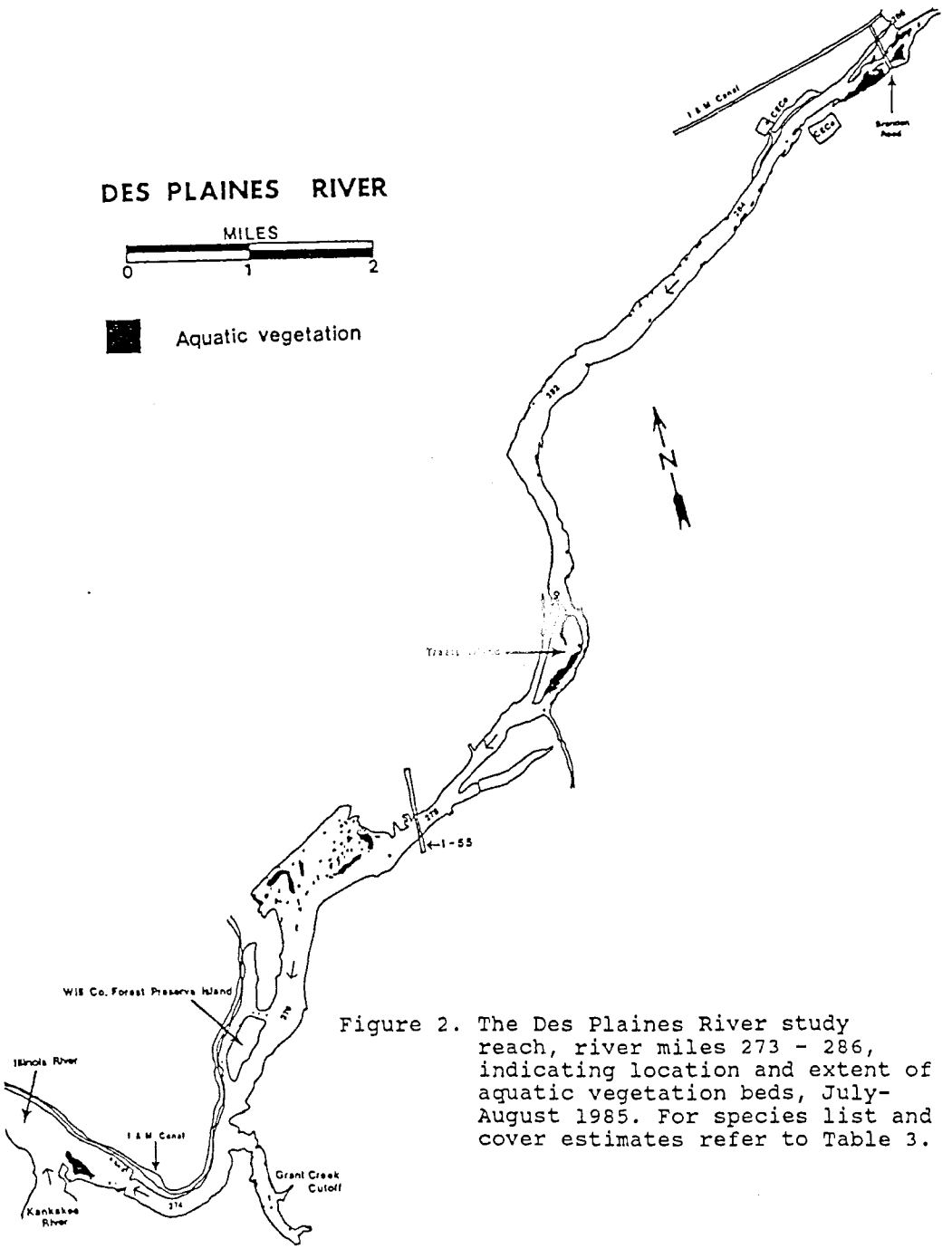

Figure 2. The Des Plaines River study reach, river miles 273 - 286, indicating location and extent of aquatic vegetation beds, July-August 1985. For species list and cover estimates refer to Table 3.

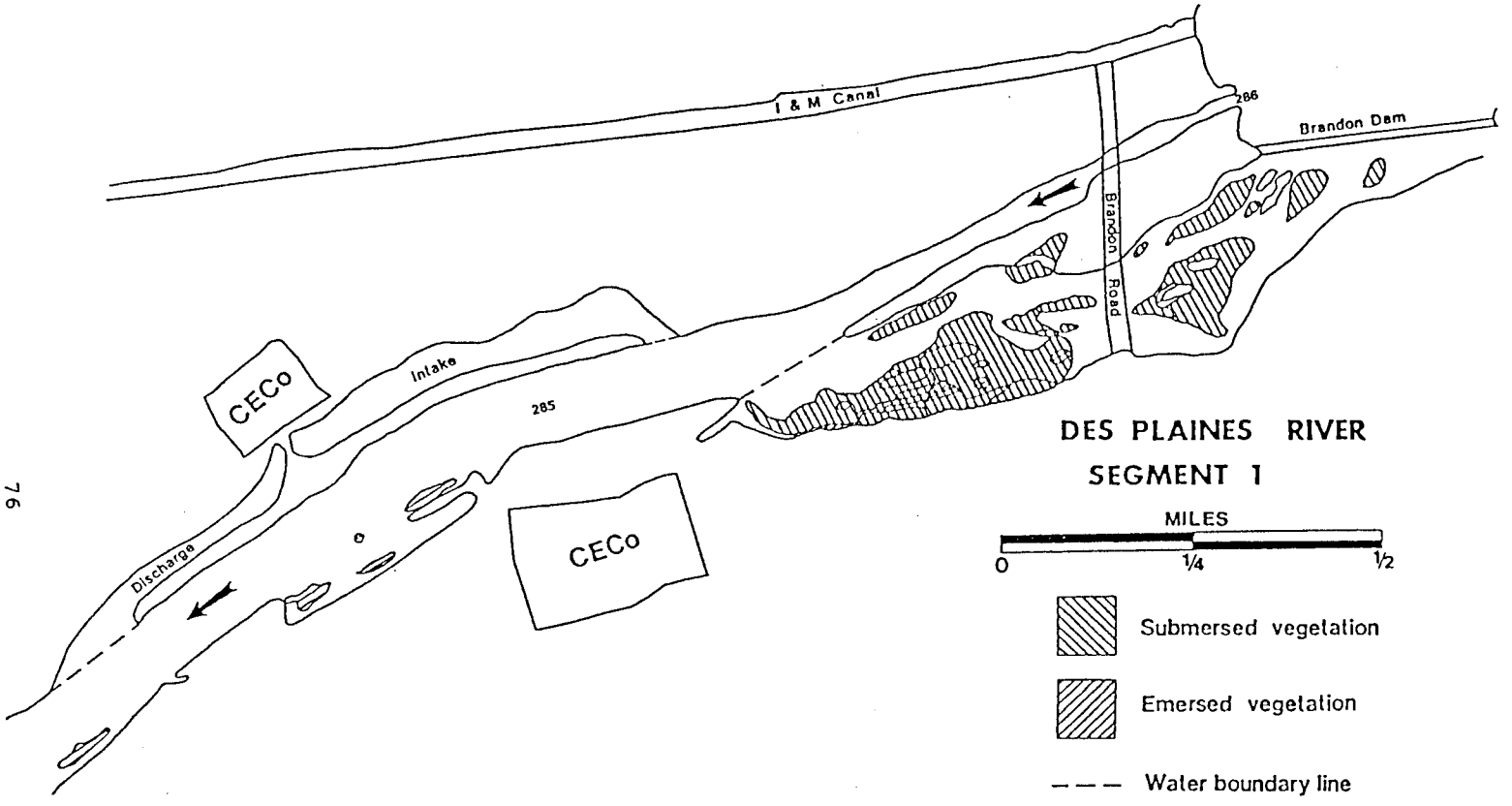

Figure 3. Segment 1 of the Des Plaines River study reach with location and extent of submersed and emersed aquatic vegetation in July-August 1985 indicated. For species list and cover estimates refer to Table 4.

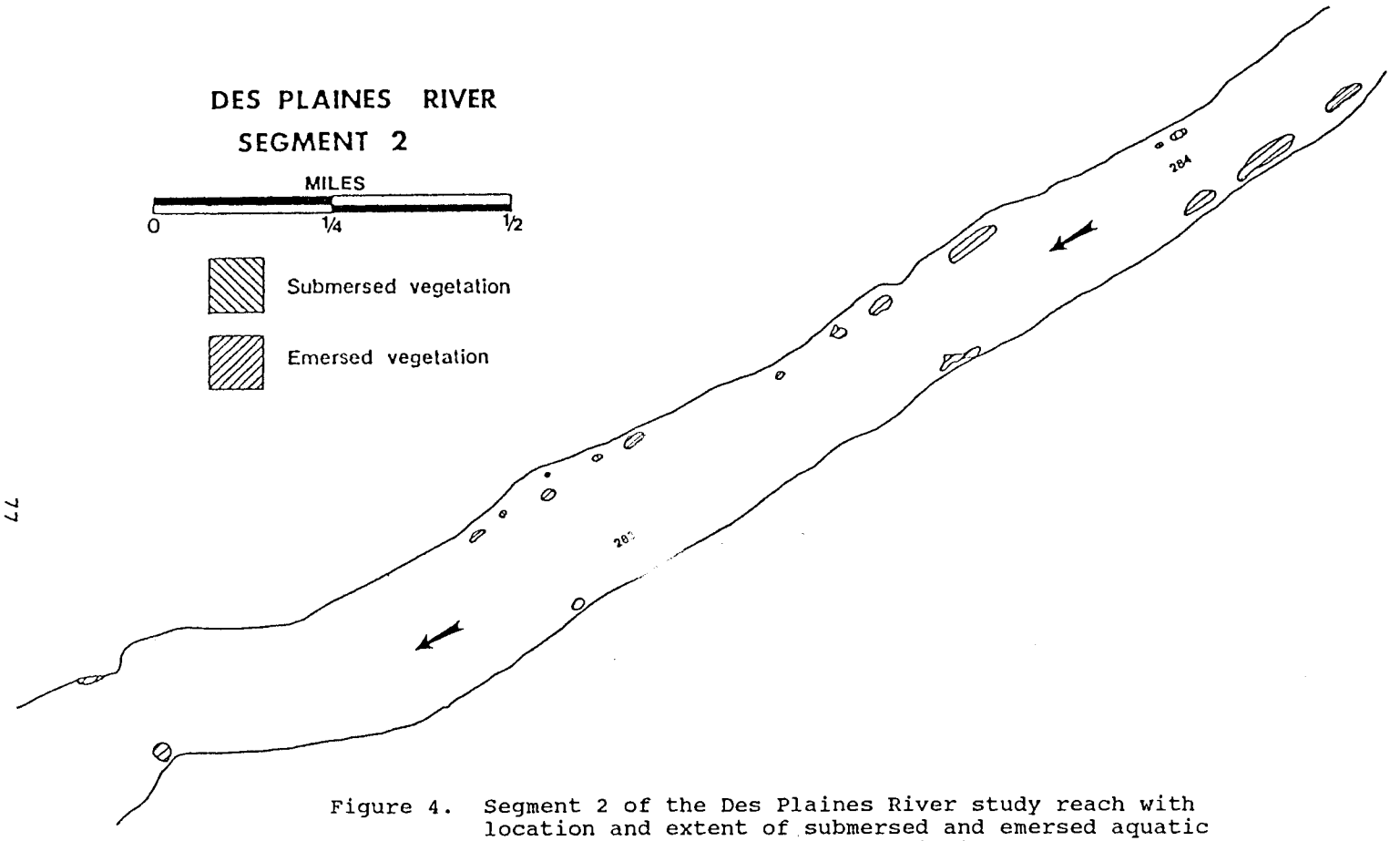

Figure 4. Segment 2 of the Des Plaines River study reach with location and extent of submersed and emersed aquatic vegetation in July-August 1985 indicated. For species list and cover estimates refer to Table 4.

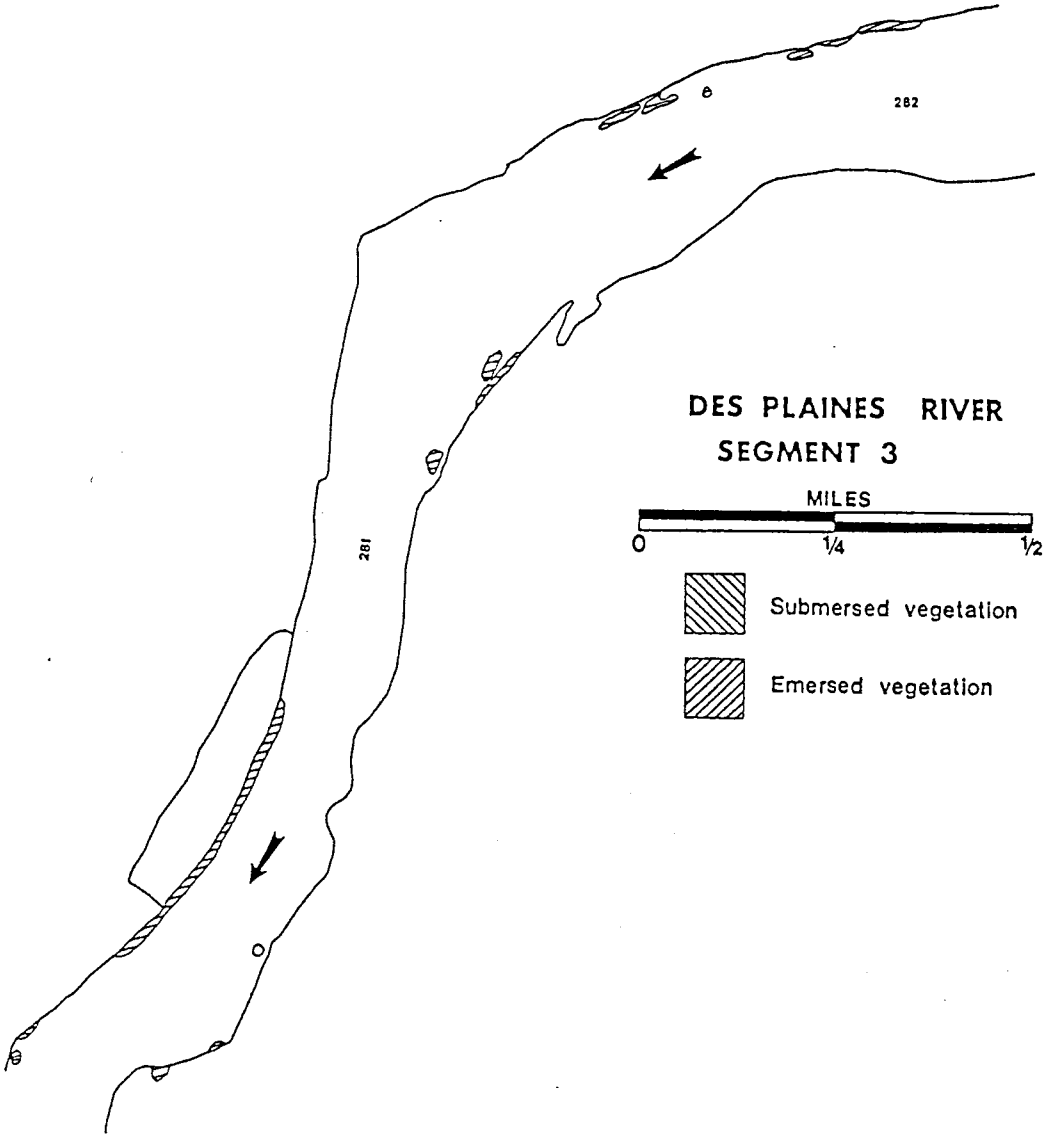

Figure 5. Segment 3 of the Des Plaines River study reach with location and extent of submersed and emersed aquatic vegetation in July-August 1985 indicated. For species list and cover estimates refer to Table 4.

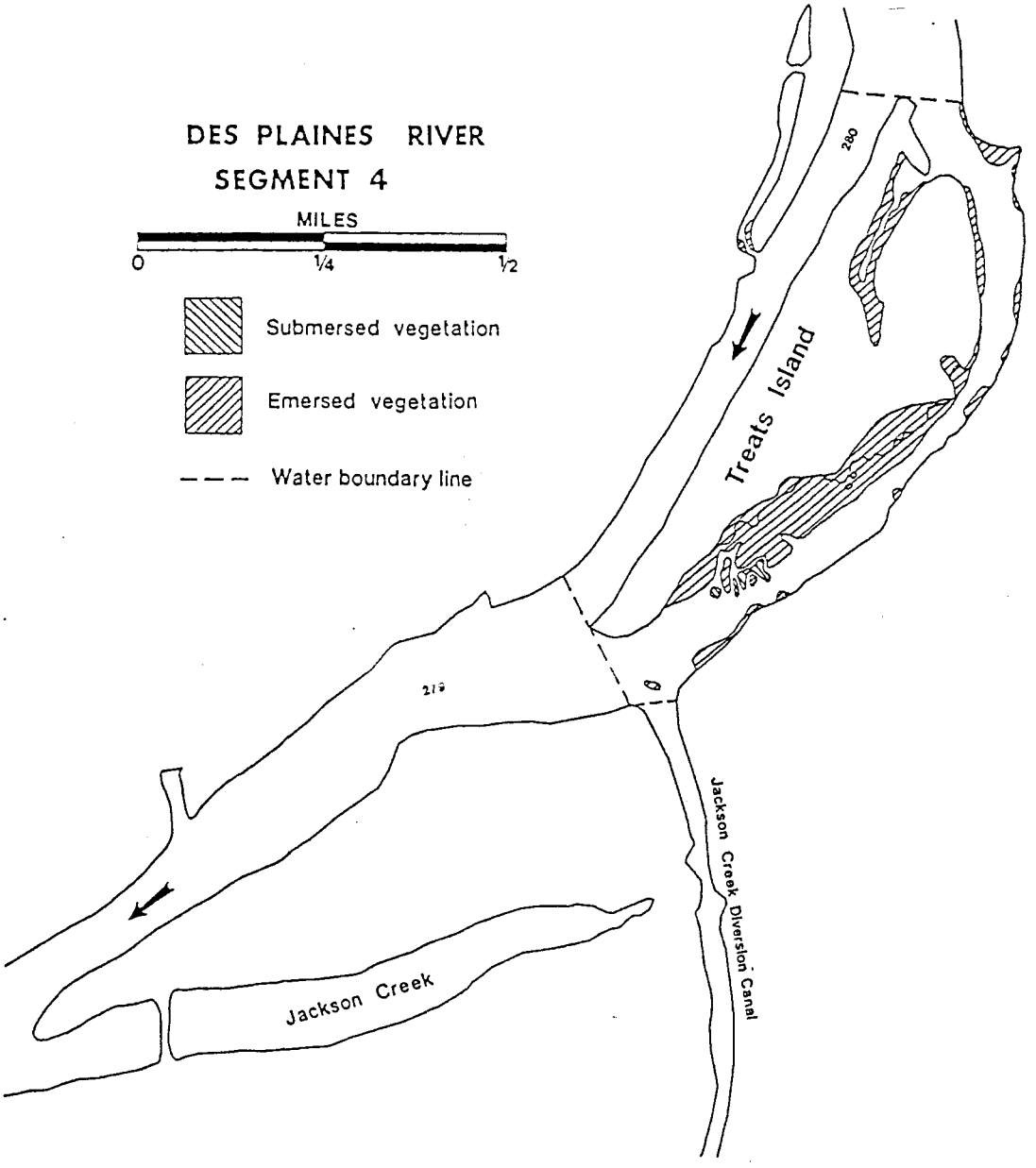

Figure 6. Segment 4 of the Des Plaines River study reach with location and extent of submersed and emersed aquatic vegetation in July-August 1985 indicated. For species list and cover estimates refer to Table 4.

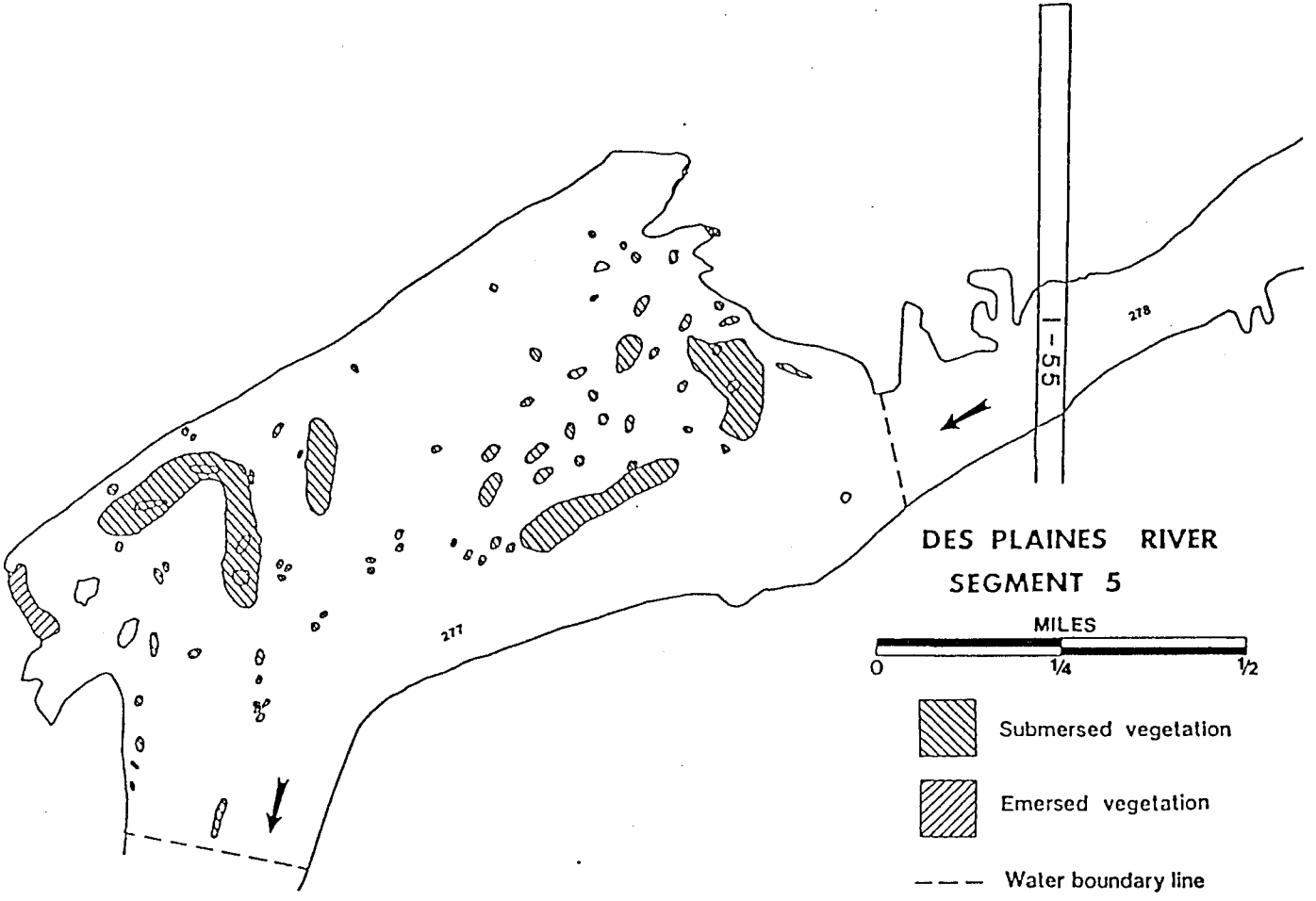

Figure 7. Segment 5 of the Des Plaines River study reach with location and extent of submersed and emersed aquatic vegetation in July-August 1985 indicated. For species list and cover estimates refer to Table 4.

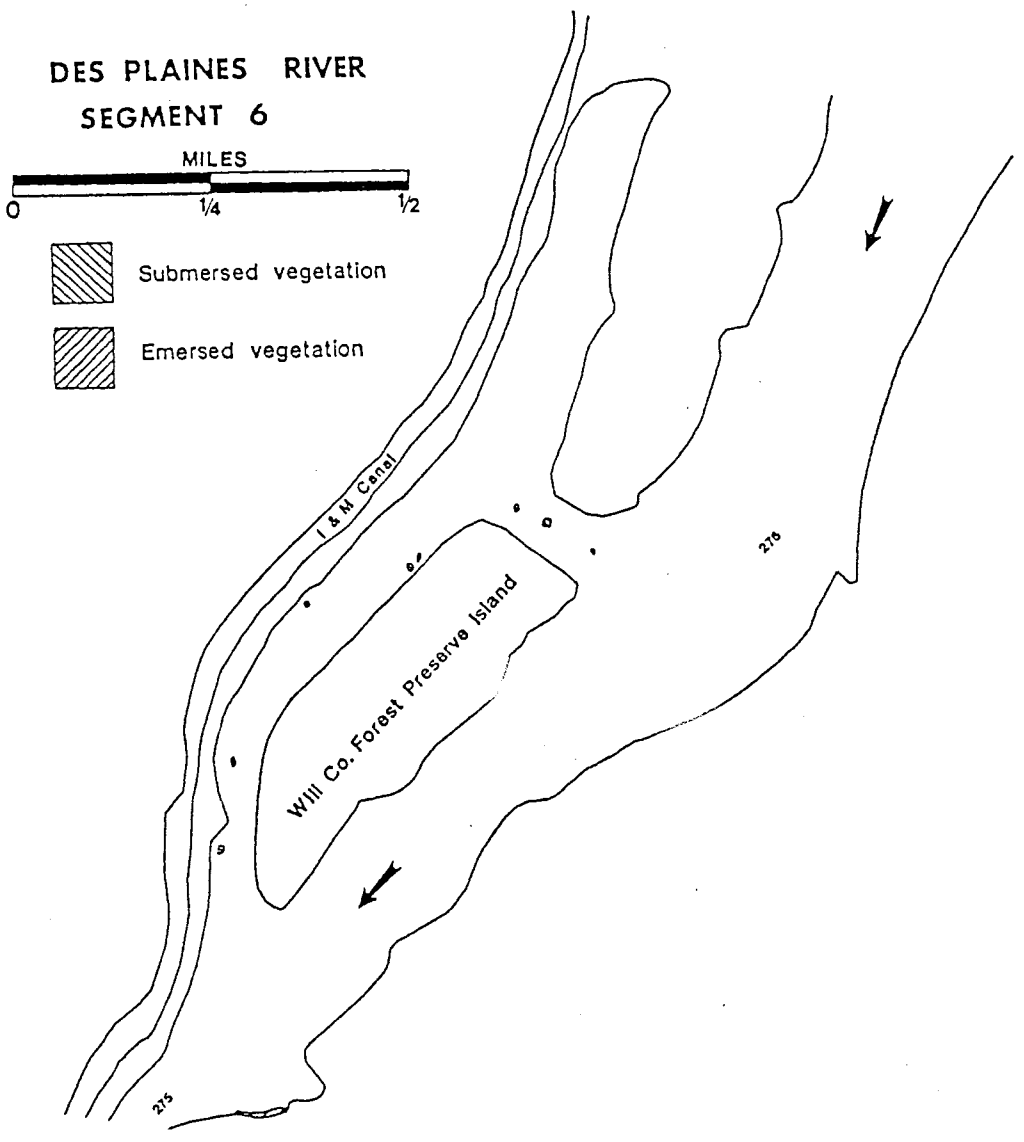

Figure 8. Segment 6 of the Des Plaines River study reach with location and extent of submersed and emersed aquatic vegetation in July-August 1985 indicated. For species list and cover estimates refer to Table 4.

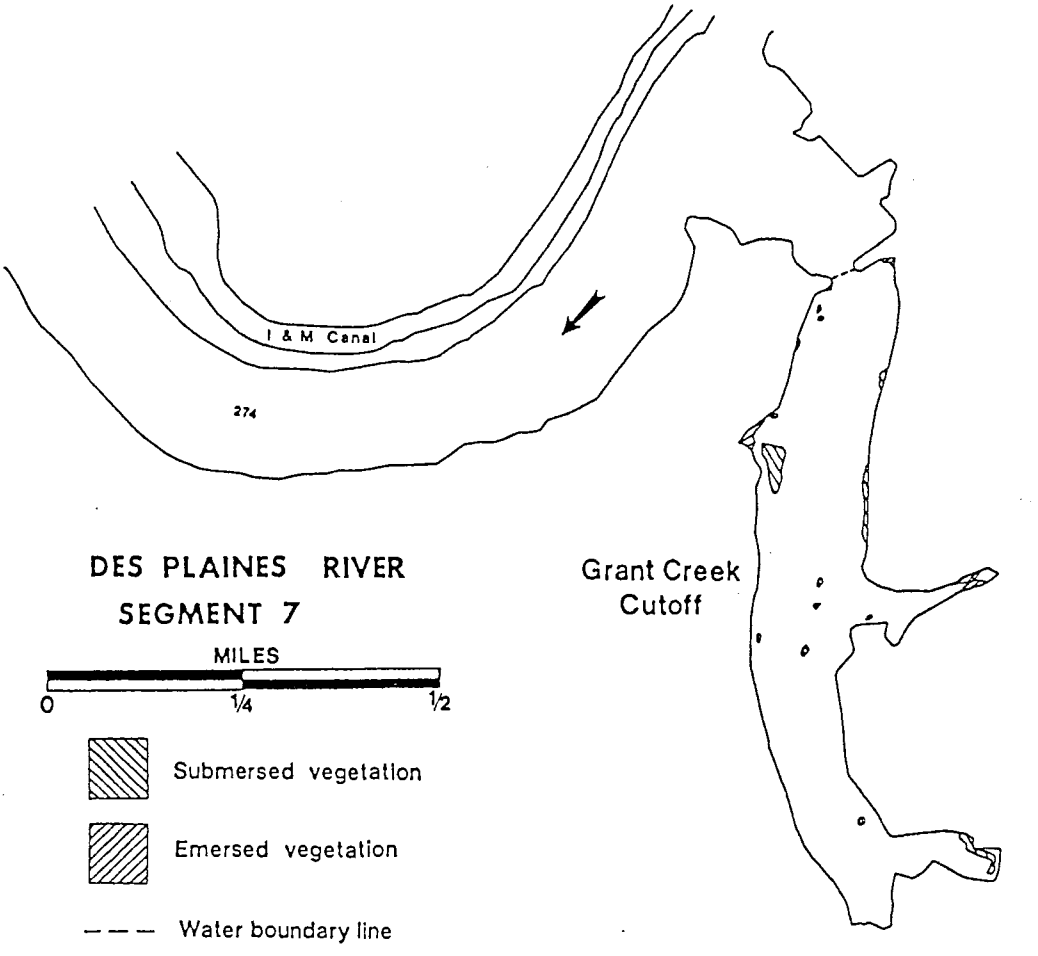

Figure 9. Segment 7 of the Des Plaines River study reach with location and extent of submersed and emersed aquatic vegetation in July-August 1985 indicated. For species list and cover estimates refer to Table 4.

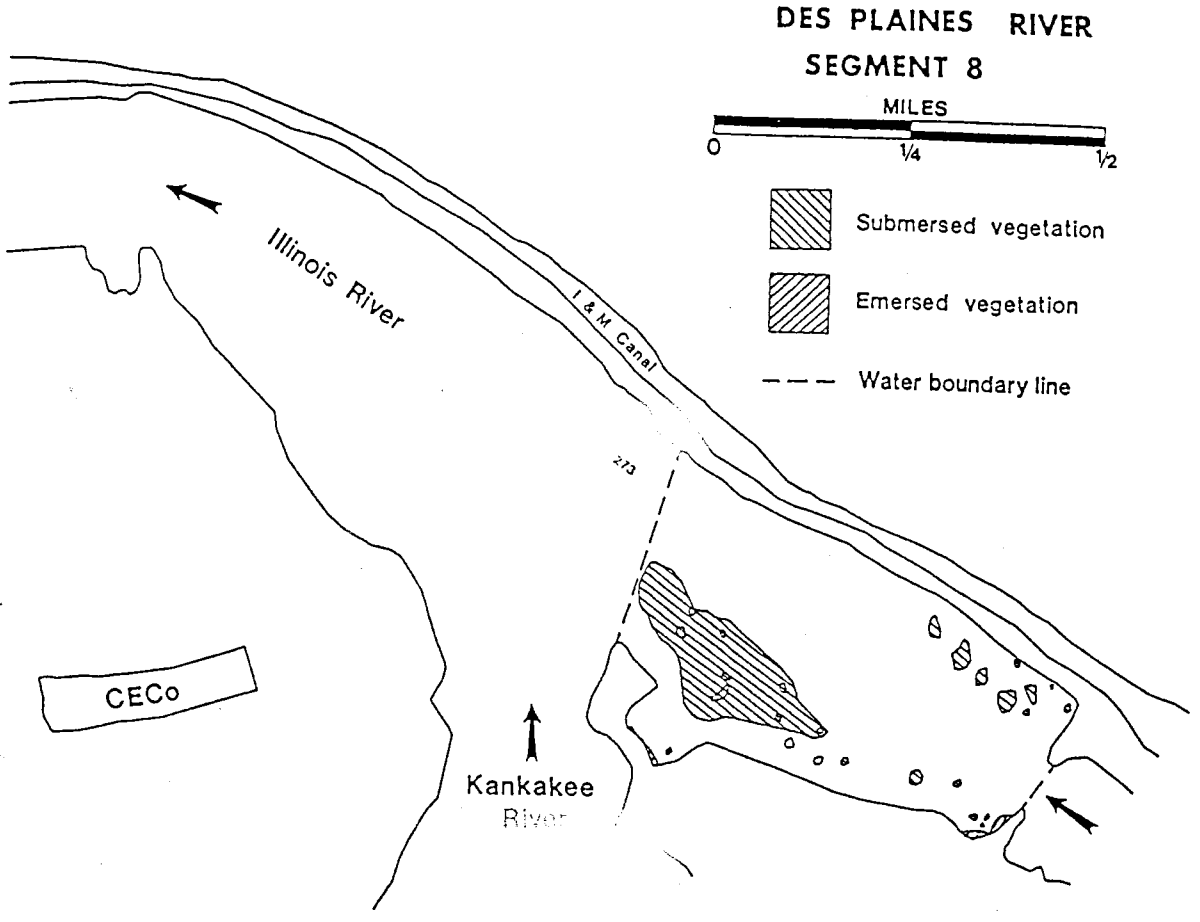

Figure 10. Segment 8 of the Des Plaines River study reach with location and extent of submersed and emersed aquatic vegetation in July-August 1985 indicated. For species list and cover estimates refer to Table 4.

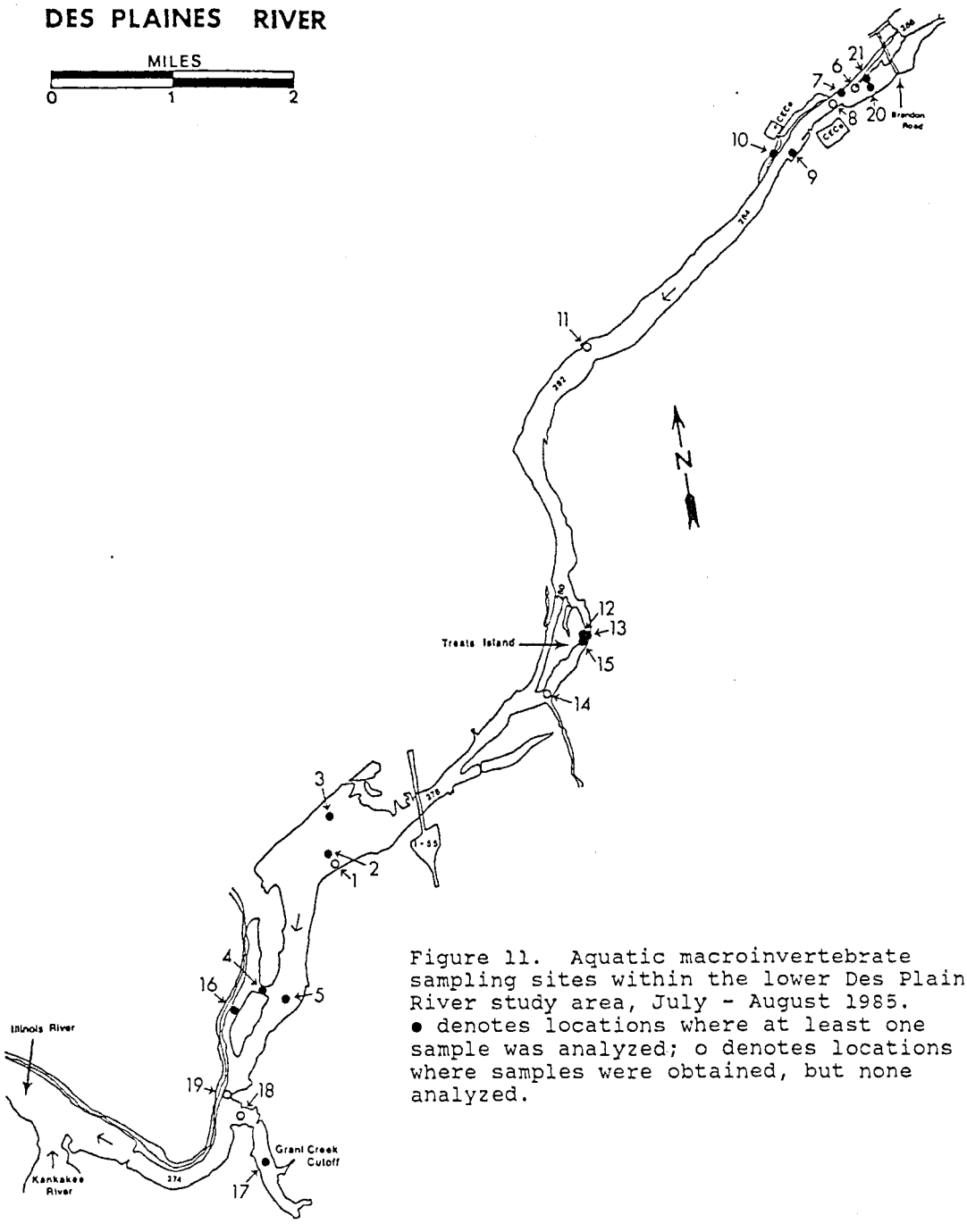

Figure 11. Aquatic macroinvertebrate sampling sites within the lower Des Plaines River study area, July - August 1985. • denotes locations where at least one sample was analyzed; o denotes locations where samples were obtained, but none analyzed.

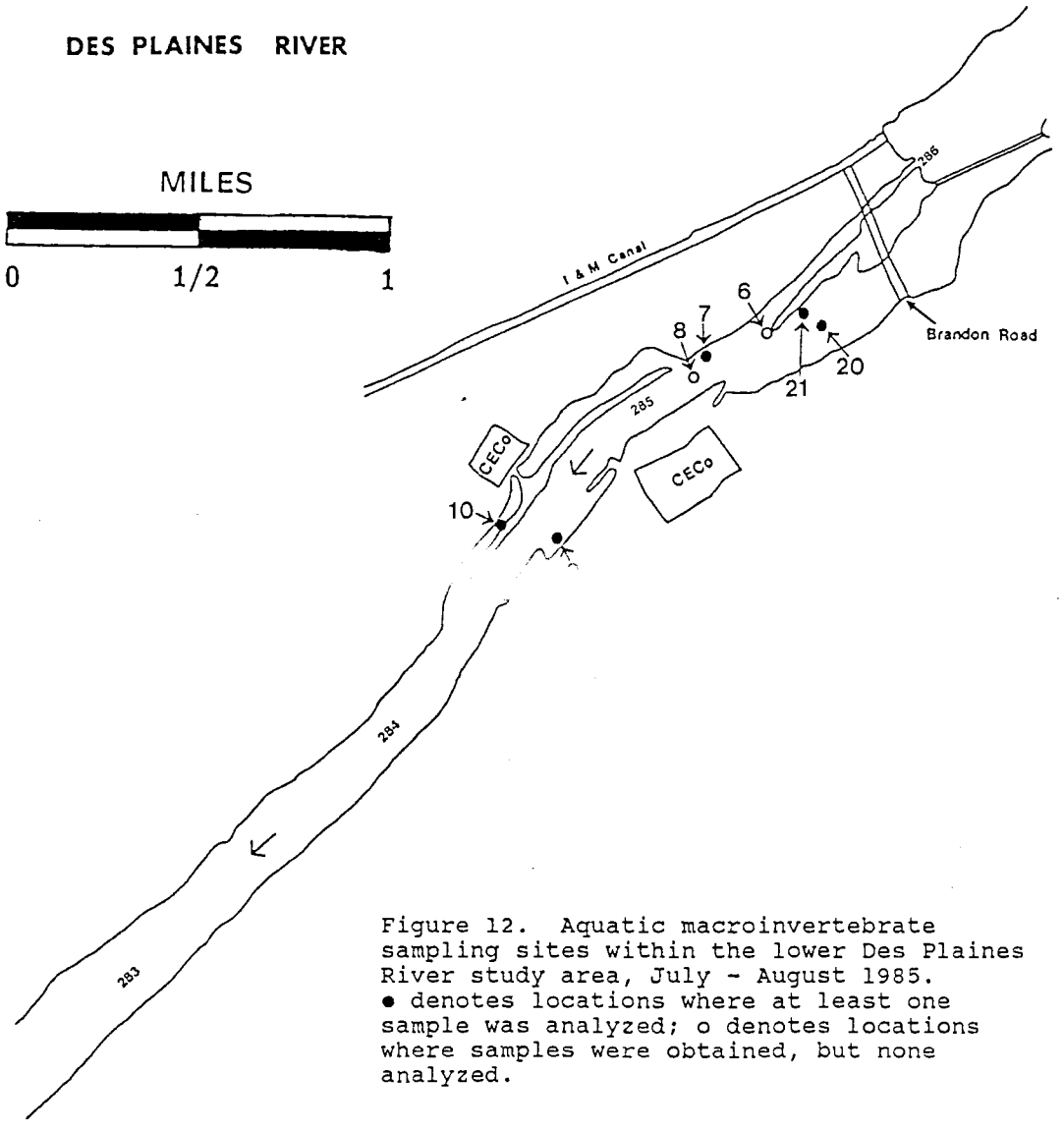

Figure 12. Aquatic macroinvertebrate sampling sites within the lower Des Plaines River study area, July - August 1985. • denotes locations where at least one sample was analyzed; o denotes locations where samples were obtained, but none analyzed.

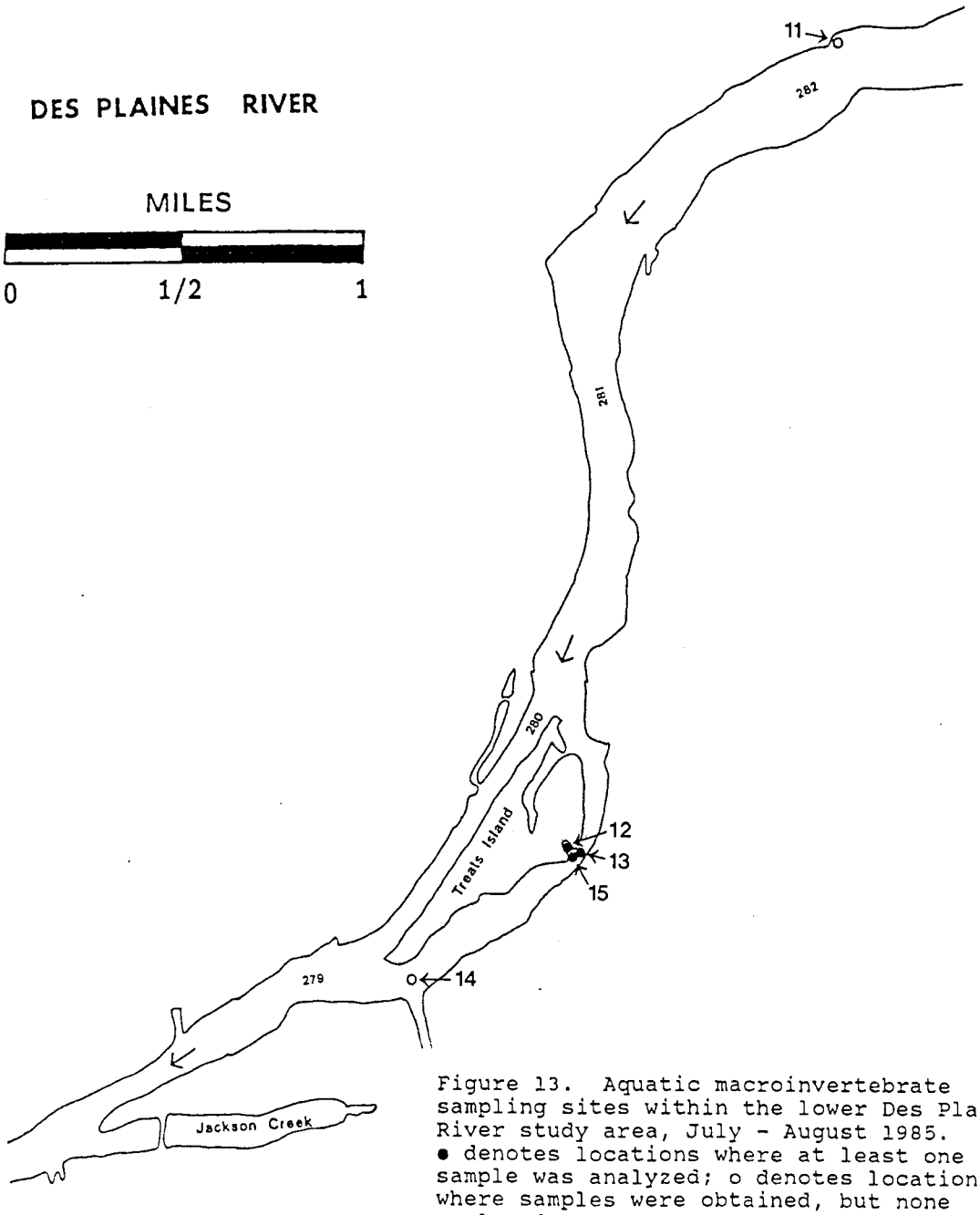

Figure 13. Aquatic macroinvertebrate sampling sites within the lower Des Plaines River study area, July - August 1985. • denotes locations where at least one sample was analyzed; o denotes locations where samples were obtained, but none analyzed.

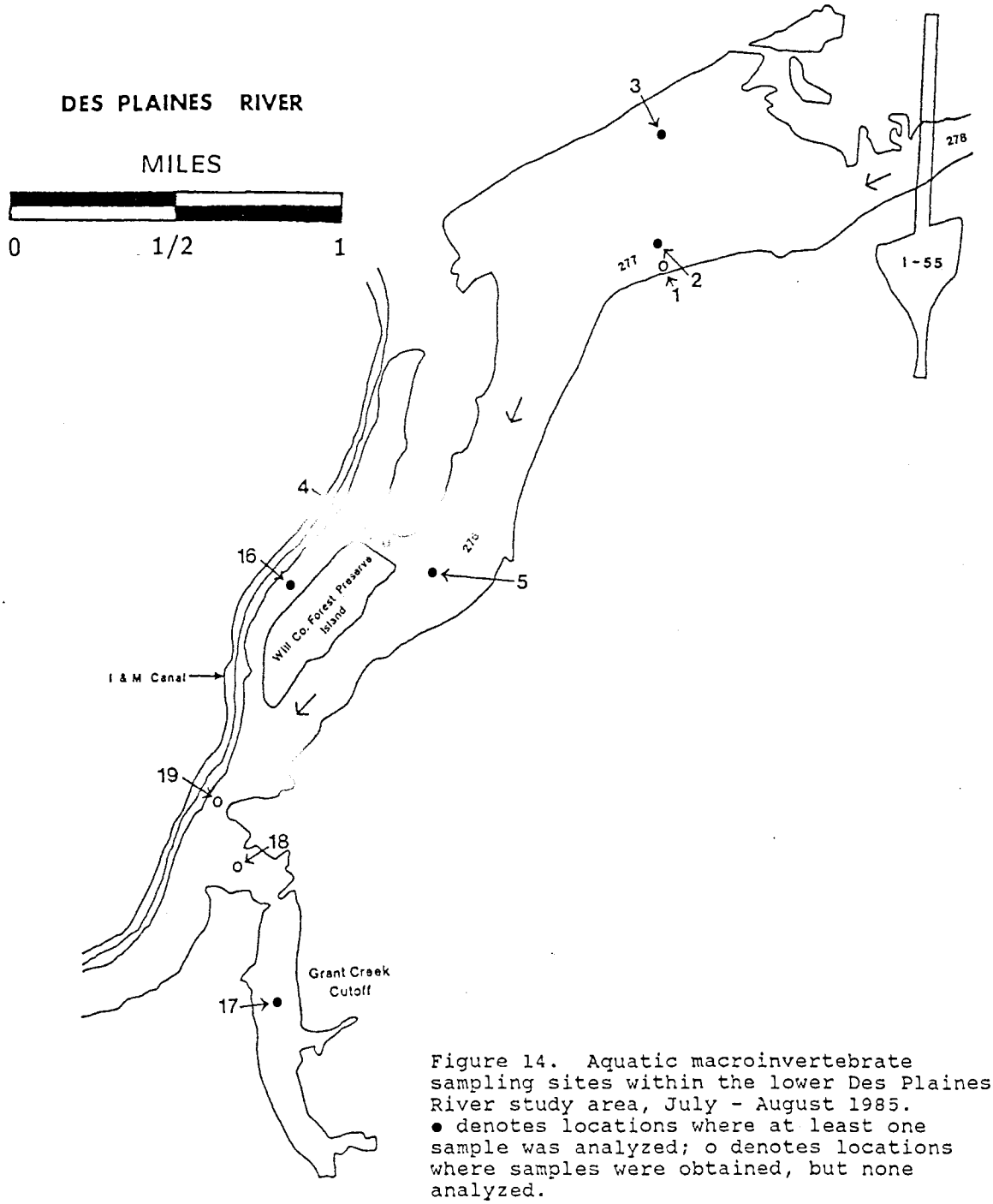

Figure 14. Aquatic macroinvertebrate sampling sites within the lower Des Plaines River study area, July - August 1985. • denotes locations where at least one sample was analyzed; o denotes locations where samples were obtained, but none analyzed.

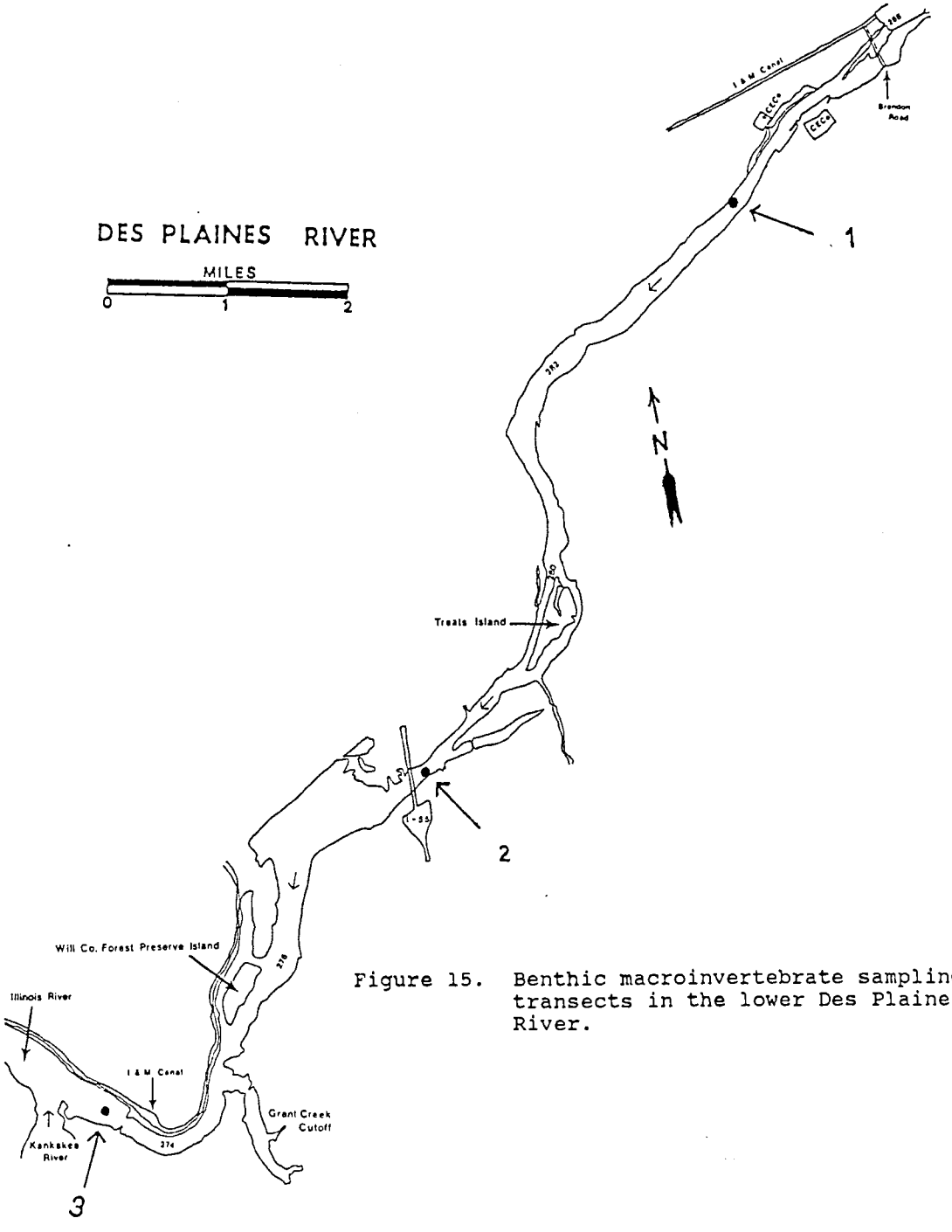

Figure 15. Benthic macroinvertebrate sampling transects in the lower Des Plaines River.

APPENDIX A

Locations of sites on the lower Des Plaines River study reach in Will County, Illinois, sampled for aquatic macroinvertebrates during July and August, 1985. Legal descriptions were obtained from U. S. Geological Survey quadrangle maps (Channahon, Ill. and Elwood, Ill. quads) of 1:24,000 scale, 7.5'-series (1954 ed., 1973PR)

Site No.	Site Location
2:	Des Plaines River (RM 277.0); 1.8 km SE Channahon; 250m from rt. bank (in DuPage flats); 3rd P.M.: T.34N, R.9E, SE/4,SW/4, SW/4,SW/4, Sec. 16. U.T.M.: Zone 16, 3_{98}800m E, 45_{85}820m N. Channahon, Ill.
3:	Des Plaines River (RM 277.2); 1.7 km SE Channahon; 50m from rt. bank (in DuPage flats); 3rd P.M.: T.34N, R.9E, NE/4,NE/4,SW/4, SW/4, Sec. 16. U.T.M.: Zone 16, 3_{98}930m E, 45_{86}160m N. Channahon, Ill.
4:	Des Plaines River (RM 275.8); 3.0 km S Channahon; 400m from left bank (just upstrm Will Co. Forest Preserve Island); 3rd P.M.: T.34N, R.9E, NW/4,SW/4,NW/[illegible]/4, Sec. 29. U.T.M.: Zone 16, 3_{97}760m E, 45_{83}470m N. Channahon, Ill.
5:	Des Plaines River (RM 275.8); 2.9 km S Channahon; 180m from rt. bank (just upstrm Will Co. Forest Preserve Island); 3rd P.M.: T.34N, R.9E, SW/4,NE/4,NE/4,NW/4, Sec. 29. U.T.M.: Zone 16, 3_{97}640m E, 45_{84}100m N. Channahon, Ill.
7:	Des Plaines River (RM 285.2); 5m from right bank; 3rd P.M.: T.35N, R.10E, NW/4,NW/4,SE/4,SW/4, Sec. 20. U.T.M.: Zone 16, 4_{07}050m E, 45_{94}340m N. Elwood, Ill.
8:	Des Plaines River (RM 285.1); 85m from left bank; 3rd P.M.: T.35N, R.10E, SE/4,NE/4,SW/4,SW/4, Sec. 20. U.T.M.: Zone 16, 4_{06}920m E, 45_{94}250m N. Elwood, Ill.
9:	Des Plaines River (RM 284.6); 10m from left bank, near Olin Chem. Corp. discharge, at edge of vegetation bed; 3rd P.M.: T.35N, R.10E, SE/4,SW/4,NE/4,NE/4, Sec. 30. U.T.M.: Zone 16, 4_{06}350m E, 45_{93}650m N. Elwood, Ill.
10:	Des Plaines River (RM 284.6); 10m from right bank; In ComEd discharge channel; depth: 3m; 3rd P.M.: T.35N, R.10E, NW/4, SW/4,NE/4,NE/4, Sec. 30. U.T.M.: Zone 16, 4_{06}100m E, 45_{93}880m N. Elwood, Ill.
12:	Des Plaines River (RM 279.8); 5.4 km ENE Channahon; 30m from left bank (in side channel behind Treat Is.); 3rd P.M.: T.34N, R.9E, N/2,NW/4,SW/4,SE/4, Sec. 11. U.T.M.: Zone 16, 4_{02}820m E, 45_{87}980m N. Channahon, Ill.

Appendix A (continued)

13: Des Plaines River (RM 279.8); 5.4 km ENE Channahon; 15m from left bank (in side channel behind Treat Is.); 3rd P.M.: T.34N, R.9E, N/2,NW/4,SW/4,SE/4, Sec. 11. U.T.M.: Zone 16, $4_{02}840$m E, $45_{87}970$m N. Channahon, Ill.

15: Des Plaines River (RM 279.8); 5.4 km ENE Channahon; 32m from left bank (in side channel behind Treat Is.); 3rd P.M.: T.34N, R.9E, N/2,NW/4,SW/4,SE/4, Sec. 11. U.T.M.: Zone 16, $4_{02}790$m E, $45_{87}970$m N. Channahon, Ill.

16: Des Plaines River (RM 275.8); 2.8 km S Channahon; 80m from left bank (behind Will Co. Forest Preserve Island); 3rd P.M.: T.34N, R.9E, SE/4,SE/4,NE/4,NW/4, Sec. 29. U.T.M.: Zone 16, $3_{97}370$m E, $45_{83}940$m N. Channahon, Ill.

17: Grant Creek/Grant Creek Cut-off, 5.1 km S Channahon; 400m upstream Grant Creek Marina bridge, (adjacent to Des Plaines River Des Plaines River (RM 274.6)); 3rd P.M.: T.34N, R.9E, S/2,SE/4,SW/4,NW/4, Sec. 32. U.T.M.: Zone 16, $3_{97}350$m E, $45_{81}900$m N. Channahon, Ill.

20: Des Plaines River (RM 285.5); 200m from left bank, 420m dwnstrm Brandon Rd. bridge; 3rd P.M.: T.35N, R.10E, SE/4, SW/4,NW/4,SE/4, Sec. 20. U.T.M.: Zone 16, $4_{07}900$m E, $45_{94}490$m N. Elwood, Ill.

21: Des Plaines River (RM 285.5); 5m from rt. bank, 380m dwnstrm Brandon Rd. bridge; 3rd P.M.: T .35N, R.10E, SW/4,NE/4,SW/4, SE/4, Sec. 20. U.T.M.: Zone 16, $4_{07}300$m E, $45_{94}370$m N. Elwood, Ill.

22: Grant Creek/Grant Creek cutoff; 5.1km S Channahon, 400m upstrm of Grant Creek Marina bridge (adjacent to RM 274.6); 3rd P.M.: T.34N, R.9E, S/2,SE/4,SW/4,NW/4, Sec. 32. U.T.M.: Zone 16, $3_{97}350$m E, $45_{81}900$m N. Channahon, Ill.

23: Des Plaines River (RM 285.5); 380m downstrm of Brandon Rd bridge; 3rd P.M.: T.35N, R.10E, SW/4,NE/4,SW/4,SE/4, Sec. 20. U.T.M.: Zone 16, 407300m E, 4594370m N.

24: Grant Creek/Grant Creek cutoff; 5.1km S Channahon, 400m upstrm of Grant Creek Marina bridge (adjacent to RM 274.6); 3rd P.M.: T.34N, R.9E, S/2,SE/4,SW/4,NW/4, Sec. 32. U.T.M.: Zone 16, $3_{97}350$m E, $45_{81}900$m N. Channahon, Ill.

25: Des Plaines River (RM 277.2); 1.7 km SE Channahon; in DuPage flats; 3rd P.M.: T.34N, R.9E, NE/4,NE/4,SW/4,SW/4, Sec. 16. U.T.M.: Zone 16, $3_{98}930$m E, $45_{86}160$m N. Channahon, Ill.

APPENDIX B. Aquatic macroinvertebrates collected by petite ponar from established transects in the lower Des Plaines River, Will and Grundy counties, Illinois, 16 January 1986.

Table B1. Aquatic macroinvertebrates (no. m^{-2}) collected by petite ponar dredge from lower Des Plaines River Site 1M (river mile 284), 16 January 1986.

Taxa	Replicate A	B	C	Mean	(± SE)
Aschelminthes					
Nematoda	42	125	0	55.7	(36.7)
Annelida					
Oligochaeta					
Enchytraeidae (unidentifiable)	42	0	0	14.0	(14.0)
Naididae (unidentifiable)	375	583	167	375.0	(120.1)
Bratislavia unidenta	42	0	0	14.0	(14.0)
Dero sp.	0	0	250	83.3	(83.3)
Dero furcata	0	42	83	41.7	(24.0)
Dero nivea	125	250	167	180.7	(36.7)
Nais sp.	42	0	0	14.0	(14.0)
Nais communis	292	0	0	97.3	(97.3)
Nais pardalis	0	83	0	27.7	(27.7)
Nais variabilis	292	0	0	97.3	(97.3)
Ophidonais serpentina	42	0	0	14.0	(14.0)
Paranais frici	0	42	83	41.7	(24.0)
Slavina appendiculata	83	0	0	27.7	(27.7)
Stylaria lacustris	42	0	0	14.0	(14.0)
Tubificidae					
Aulodrilus pigueti	292	4,500	917	1,903.0	(1,311.0)
Ilyodrilus templetoni	0	167	167	111.3	(55.7)
Limnodrilus sp.	42	167	0	69.7	(50.2)
Limnodrilus cervix	125	167	83	125.0	(24.2)
Limnodrilus cervix variant	0	0	83	27.7	(27.7)
Limnodrilus hoffmeisteri	2,042	1,500	1,667	1,736.3	(160.3)
L. hoffmeisteri f. *spiralis*	42	0	0	14.0	(14.0)
Quistadrilus multisetosus	167	1,000	1,167	778.0	(309.3)
UIW/OCC[a]	3,417	8,333	8,333	6,694.3	(1,638.7)
UIW/CC[b]	417	2,250	1,000	1,222.3	(540.7)
Total Oligochaeta	7,921	19,084	14,167	13,724.0	(3,230.1)
Arthropoda					
Insecta					
Ephemeroptera					
Baetidae					
Psuedocloeon sp.	0	0	42	14.0	(14.0)

Table B1 concluded.

Taxa	Replicate A	Replicate B	Replicate C	Mean	(± SE)
Diptera					
Chironomidae					
Tanypodinae					
Procladiini					
Procladius sp.	0	167	0	55.7	(55.7)
Orthocladiinae					
Cricotopus bicinctus	42	0	0	14.0	(14.0)
Cricotopus sylvestris	0	42	0	14.0	(14.0)
Nanocladius sp.	42	42	0	28.0	(14.0)
Chironominae					
Chironomini					
Chironomus sp.	0	42	0	14.0	(14.0)
Parachironomus nr. *monochromus*	167	1,417	333	639.0	(391.9)
Polypedilum nr. *scalaenum*	0	0	42	14.0	(14.0)
Total Chironomidae	251	1,710	375	778.7	(269.6)
Mollusca					
Pelecypoda					
Corbiculidae					
Corbicula fluminea	0	83	83	55.3	(27.7)
Total organisms			,667	14,627.7	(3,691.6)
Total taxa	16	16	12	14.7	(1.3)[c]
Sample diversity	1.83	1.72	1.84	1.80	(0.04)
Sample evenness	0.66	0.62	0.74	0.67	(0.04)

[a] = unidentifiable immatures without capilliform chaetae
[b] = unidentifiable immatures with capilliform chaetae
[c] = total of 26 taxa from 3 replicates

Table B2. Aquatic macroinvertebrates (no. m^{-2}) collected by petite ponar dredge from lower Des Plaines River Site 1R (river mile 284), 16 January 1986.

Taxa	Replicate A	Replicate B	Replicate C	Mean	(± SE)
Aschelminthes					
Nematoda	250	292	167	236.3	(36.7)
Annelida					
Oligochaeta					
Naididae (unidentifiable)	375	500	333	402.7	(50.2)
Dero furcata	0	0	42	14.0	(14.0)
Dero nivea	83	667	42	264.0	(201.8)
Nais sp.	167	0	0	55.7	(55.7)
Nais barbata	42	83	0	41.7	(24.0)
Nais communis	83	0	0	27.7	(27.7)
Ophidonais serpentina	42	0	42	28.0	(14.0)
Paranais frici	0	167	0	55.7	(55.7)
Pristinella osborni	0	167	42	69.7	(50.2)
Tubificidae					
Aulodrilus pigueti	1,250	167	42	486.3	(383.5)
Limnodrilus sp.	42	250	0	97.3	(77.3)
Limnodrilus cervix	458	83	0	180.3	(140.9)
Limnodrilus cervix variant	83	0	42	41.7	(24.0)
Limnodrilus hoffmeisteri	583	2,167	750	1,166.6	(502.5)
Quistadrilus multisetosus	1,250	1,083	583	972.0	(200.4)
UIW/OCC[a]	5,958	9,750	2,750	6,152.7	(2,023.1)
UIW/CC[b]	542	1,667	500	903.0	(382.2)
Total Oligochaeta	10,958	16,751	5,168	10,959.0	(3,343.7)
Arthropoda					
Insecta					
Trichoptera (unidentifiable)	0	42	0	14.0	(14.0)
Diptera					
Chironomidae					
Tanypodinae					
Procladiini					
Procladius sp.	125	42	0	55.7	(63.6)
Orthocladiinae					
Cricotopus bicinctus	0	42	0	14.0	(14.0)
Nanocladius sp.	0	83	0	27.7	(27.7)
Parakiefferiella sp.	0	83	0	27.7	(27.7)

Table B2 concluded.

Taxa	Replicate A	B	C	Mean	(± SE)
Chironominae					
Chironomini					
Dicrotendipes nervosus	83	83	0	55.3	(27.7)
Parachironomus nr. directus	42	0	0	14.0	(14.0)
Parachironomus nr. monochromus	1,042	1,542	208	930.7	(389.1)
Total Chironomidae	1,292	1,875	208	1,125.0	(488.4)
Total organisms	12,501	18,960	5,543	12,334.7	(3,874.0)
Total taxa	13	16	9	12.7	(2.0)
Sample diversity	2.0	1.99	1.59	1.86	(0.13)
Sample evenness	0.78	0.72	0.72	0.74	(0.02)

[a] = unidentifiable imma... ...liform chaetae
[b] = unidentifiable immatures wit... ...orm chaetae
[c] = total of 20 taxa from three replicates

Table B3. Aquatic macroinvertebrates (no. m^{-2}) collected by petite ponar dredge from Des Plaines River Site 1L (river mile 284), 16 January 1986.

Taxa	Replicate A	Replicate B	Replicate C	Mean	(± SE)
Aschelminthes					
Nematoda	208	42	0	83.3	(63.5)
Annelida					
Oligochaeta					
Naididae (unidentifiable)	250	42	167	153.0	(60.5)
Dero digitata	125	83	417	208.3	(105.0)
Dero nivea	208	0	0	69.3	(69.3)
Nais pardalis	42	0	0	14.0	(14.0)
Paranais frici	0	0	42	14.0	(14.0)
Tubificidae					
Aulodrilus pigueti	167	875	292	444.7	(218.2)
Ilyodrilus templetoni	42	292	42	125.3	(83.3)
Limnodrilus sp.	42	0	0	14.0	(14.0)
Limnodrilus cervix	42	0	42	28.0	(14.0)
Limnodrilus cervix variant	0	125	42	55.7	(36.7)
Limnodrilus hoffmeisteri	542	917	333	597.3	(170.8)
L. hoffmeisteri f. *spiralis*	42	0	0	14.0	(14.0)
Quistadrilus multisetosus	167	125	125	139.0	(14.0)
Tubifex tubifex	0	83	0	27.7	(27.7)
UIW/OCC[a]	1,708	3,417	5,792	3,639.0	(1,184.2)
UIW/CC[b]	125	917	1,000	680.7	(278.9)
Total Oligochaeta	3,502	6,876	8,294	6,224.0	(1,421.2)
Arthropoda					
Insecta					
Diptera					
Chironomidae					
Orthocladiinae					
Cricotopus sylvestris	42	0	0	14.0	(14.0)
Chironominae					
Chironomini					
Parachironomus nr. *monochromus*	0	167	83	83.3	(48.2)
Total Chironomidae	42	167	83	97.3	(36.8)

Table B3 concluded.

Taxa	Replicate A	Replicate B	Replicate C	Mean	(± SE)
Mollusca					
Pelecypoda					
Corbiculidae					
Corbicula fluminea	0	0	42	14.0	(14.0)
Total organisms	3,752	7,085	8,419	6,418.7	(1,387.8)[c]
Total taxa	10	9	9	9.3	(0.3)
Sample diversity	1.94	1.71	1.86	1.84	(0.06)
Sample evenness	0.84	0.78	0.85	0.82	(0.02)

[a] = unidentifiable immatures without capilliform chaetae
[b] = unidentifiable immatures with capilliform chaetae
[c] = total of 14 taxa from 3

Table B4. Aquatic macroinvertebrates (no. m^{-2}) collected by petite ponar dredge from lower Des Plaines River Site 2M (river mile 278.0), 16 January 1986.

Taxa	Replicate A	Replicate B	Replicate C	Mean	(± SE)
Annelida					
Oligochaeta					
Naididae					
Nais barbata	0	42	0	14.0	(14.0)
Nais variabilis	42	0	0	14.0	(14.0)
Ophidonais serpentina	0	42	0	14.0	(14.0)
Tubificidae					
Aulodrilus pigueti	42	42	42	42.0	(0.0)
Ilyodrilus templetoni	42	0	83	41.7	(24.0)
Limnodrilus sp.	0	42	0	14.0	(14.0)
Limnodrilus cervix	167	42	83	97.3	(36.8)
Limnodrilus cervix variant	0	42	292	111.3	(91.1)
Limnodrilus claparedianus	42	0	0	14.0	(14.0)
Limnodrilus hoffmeisteri	583	542	625	583.0	(24.0)
L. hoffmeisteri f. *spiralis*	0	42	0	14.0	(14.0)
Quistadrilus multisetosus	42	0	0	14.0	(14.0)
UIW/OCC[a]	458	1,167	833	819.3	(204.8)
UIW/CC[b]	125	375	167	222.3	(77.3)
Total Oligochaeta	1,543	2,378	2,125	2,015.3	(247.2)
Total organisms	1,543	2,378	2,125	2,015.3	(247.2)[c]
Total taxa	7	5	4	5.3	(0.9)[c]
Sample diversity	1.29	0.93	1.01	1.08	(0.11)
Sample evenness	0.66	0.58	0.73	0.66	(0.04)

[a] = unidentifiable immatures without capilliform chaetae
[b] = unidentifiable immatures with capilliform chaetae
[c] = total of 9 taxa from 3 replicates

Table B5. Aquatic macroinvertebrates (no. m^{-2}) collected by petite ponar dredge from lower Des Plaines River Site 2R (river mile 278.0), 16 January 1986.

Taxa	Replicate A	Replicate B	Replicate C	Mean	(± SE)
Aschelminthes					
Nematoda	0	208	0	69.3	(69.3)
Annelida					
Oligochaeta					
Naididae (unidentifiable)	125	1,167	83	458.3	(354.5)
Dero nivea	83	0	0	27.7	(27.7)
Nais barbata	42	0	0	14.0	(14.0)
Paranais frici	1,083	2,250	250	1,194.3	(580.0)
Haemonais waldvogeli	42	0	0	14.0	(14.0)
Tubificidae					
Aulodrilus pigueti	792	1,667	83	847.3	(458.1)
Ilyodrilus templetoni	667	167	667	500.3	(166.7)
Limnodrilus sp.	0	83	167	83.3	(48.2)
Limnodrilus cervix	0	250	83	111.0	(73.5)
Limnodrilus cervix variant	42	[illegible]	500	208.3	(146.3)
Limnodrilus hoffmeisteri	[illegible]	583	3,667	1,639.0	(1,014.3)
Quistadrilus multisetosus	208	417	0	208.3	(120.4)
UIW/OCC[a]	2,917	6,000	7,333	5,416.7	(1,307.7)
UIW/CC[b]	833	2,833	1,750	1,805.3	(578.0)
Total Oligochaeta	7,501	15,500	14,583	12,528.0	(2,527.4)
Arthropoda					
Insecta					
Odonata					
Anisoptera					
Gomphidae					
Gomphus sp.	0	0	42	14.0	(14.0)
Diptera					
Chironomidae					
Tanypodinae					
Procladiini					
Procladius sp.	208	125	83	138.7	(36.7)

Table B5 concluded.

Taxa	Replicate A	Replicate B	Replicate C	Mean	(± SE)
Chironominae					
Chironomini					
Parachironomus nr. *monochromus*	42	208	83	111.0	(49.9)
Total Chironomidae	250	333	166	249.7	(83.5)
Mollusca					
Pelecypoda					
Corbiculidae					
Corbicula fluminea	42	0	0	14.0	(14.0)
Total organisms	7,793	16,041	14,791	12,875.0	(2,566.5)[c]
Total taxa	12	9	8	9.7	(1.2)[c]
Sample diversity	1.92	1.71	1.13	1.59	(0.24)
Sample evenness	0.77	0.78	0.54	0.7	(0.08)

[a] = unidentifiable immatures without capilliform chaetae
[b] = unidentifiable immatures with capilliform chaetae
[c] = total of 14 taxa from 3 replicates

Table B6. Aquatic macroinvertebrates (no. m^{-2}) collected by petite ponar dredge from lower Des Plaines River Site 2L (river mile 278.0), 16 January 1986.

Taxa	Replicate A	B	C	Mean	(± SE)
Arthropoda					
Crustacea					
Amphipoda					
Talitridae					
Hyalella azteca	0	0	42	14.0	(14.0)
Insecta					
Diptera					
Chironomidae					
Orthocladiinae					
Nanocladius sp.	0	42	0	14.0	(14.0)
Total Chironomidae	0	42	0	14.0	(14.0)
Total organisms	0	42	42	28.0	(14.0)[a]
Total taxa	0	1	1	0.7	(0.3)[a]
Sample diversity	0	0	0	0	(0.0)
Sample evenness	0	0	0	0	(0.0)

[a] = total of 2 taxa from 3 replicates

Table B7. Aquatic maroinvertebrates (no. m^{-2}) collected by petite ponar dredge from lower Des Plaines River Site 3M (river mile 273.5), 16 January 1986.

Taxa	Replicate A	Replicate B	Replicate C	Mean	(± SE)
Aschelminthes					
Nematoda	0	42	0	14.0	(14.0)
Annelida					
Oligochaeta					
Naididae (unidentifiable)	417	42	0	153.0	(132.6)
Dero nivea	0	0	83	27.7	(27.7)
Nais communis	0	208	0	69.3	(69.3)
Ophidonais serpentina	0	0	42	14.0	(14.0)
Paranais frici	1,667	1,417	750	1,278.0	(273.7)
Tubificidae					
Aulodrilus pigueti	500	750	583	611.0	(73.5)
Ilyodrilus templetoni	333	167	0	166.7	(96.1)
Limnodrilus sp.	0	42	0	14.0	(14.0)
Limnodrilus cervix	83	292	83	152.7	(69.7)
Limnodrilus cervix variant	0	42	0	14.0	(14.0)
Limnodrilus hoffmeisteri	750	833	875	819.3	(36.7)
Limnodrilus maumeensis	0	83	125	69.3	(36.7)
Quistadrilus multisetosus	500	667	542	569.7	(50.2)
UIW/OCC[a]	6,500	5,042	2,958	4,833.3	(1,027.8)
UIW/CC[b]	2,833	1,458	625	1,638.7	(643.8)
Total Oligochaeta	13,583	11,043	6,666	10,430.7	(2,020.1)
Arthropoda					
Insecta					
Diptera					
Chironomidae					
Tanypodinae					
Procladiini					
Procladius sp.	167	1,000	1,542	903.0	(399.9)
Chironominae					
Chironomini					
Dicrotendipes nervosus	0	0	42	14.0	(14.0)
Parachironomus nr. *monochromus*	83	83	167	111.0	(28.0)
Total Chironomidae	250	1,083	1,751	1,028.0	(434.2)

Table B7 concluded.

Taxa	Replicate A	B	C	Mean	(± SE)
Mollusca					
Pelecypoda					
Corbiculidae					
Corbicula fluminea	0	0	42	14.0	(14.0)
Total organisms	13,833	12,168	8,459	11,486.7	(1,588.3)[c]
Total taxa	8	11	12	10.3	(1.2)
Sample diversity	1.68	2.02	1.93	1.88	(0.10)
Sample evenness	0.81	0.84	0.78	0.81	(0.02)

[a] = unidentifiable immatures without capilliform chaetae
[b] = unidentifiable immatur[illegible]iform chaetae
[c] = total of 14 taxa from [illegible]

Table B8. Aquatic macroinvertebrates (no. m^{-2}) collected by petite ponar dredge from lower Des Plaines River Site 3R (river mile 273.5), 16 January 1986.

Taxa	Replicate A	Replicate B	Replicate C	Mean	(± SE)
Annelida					
Oligochaeta					
Naididae (unidentifiable)	42	42	42	42.0	(0.0)
Dero sp.	0	0	42	14.0	(14.0)
Dero digitata	0	83	0	27.7	(27.7)
Dero nivea	0	42	0	14.0	(14.0)
Paranais frici	83	0	83	55.3	(27.7)
Tubificidae					
Aulodrilus pigueti	375	458	458	430.3	(27.7)
Ilyodrilus templetoni	417	83	500	333.3	(127.4)
Limnodrilus sp.	125	42	83	83.3	(24.0)
Limnodrilus cervix	250	42	292	194.7	(77.3)
Limnodrilus cervix variant	42	42	0	28.0	(14.0)
Limnodrilus hoffmeisteri	417	583	458	486.0	(49.9)
L. hoffmeisteri f. *spiralis*	42	0	0	14.0	(14.0)
Limnodrilus maumeensis	42	0	0	14.0	(14.0)
Quistadrilus multisetosus	833	458	1,042	777.7	(170.8)
UIW/OCC[a]	1,750	2,542	2,875	2,389.0	(333.6)
UIW/CC[b]	458	542	1,000	666.7	(168.4)
Total Oligochaeta	4,876	4,959	6,875	5,570.0	(652.9)
Arthropoda					
Insecta					
Diptera					
Chironomidae (unidentifiable)	42	0	0	14.0	(14.0)
Tanypodinae					
Procladiini					
Procladius sp.	3,667	9,458	6,833	6,652.7	(1,674.1)
Total Chironomidae	3,709	9,458	6,833	6,666.7	(1,661.7)
Total organisms	8,585	14,417	13,708	12,236.7	(1,837.3)[c]
Total taxa	8	8	8	8	(0.0)[c]
Sample diversity	1.36	0.69	1.10	1.05	(0.20)
Sample evenness	0.65	0.33	0.53	0.50	(0.09)

[a] = unidentifiable immatures without capilliform chaetae
[b] = unidentifiable immatures with capilliform chaetae
[c] = total of 10 taxa from 3 replicates

Table B9. Aquatic macroinvertebrates (no. m^{-2}) collected by petite ponar dredge from lower Des Plaines River Site 3L (river mile 273.5), 16 January 1986.

Taxa	Replicate A	B	C	Mean	(± SE)
Aschelminthes					
Nematoda	0	0	42	14.0	(14.0)
Annelida					
Oligochaeta					
Naididae (unidentifiable)	42	83	125	83.3	(24.0)
Amphichaeta leydigi	42	0	0	14.0	(14.0)
Dero digitata	0	0	167	55.7	(55.7)
Dero nivea	83	0	0	27.7	(27.7)
Nais communis	42	0	0	14.0	(14.0)
Nais variabilis	83	125	0	69.3	(36.7)
Paranais frici	125	417	125	222.3	(97.3)
Tubificidae					
Aulodrilus pigueti	1,125	1,917	42	1,028.0	(543.4)
Ilyodrilus templetoni	250	208	917	458.3	(229.7)
Limnodrilus sp.	42	0	83	41.7	(24.0)
Limnodrilus cervix	167	83	125	125.0	(24.2)
Limnodrilus claparedianus	0	0	42	14.0	(14.0)
Limnodrilus hoffmeisteri	458	167	292	305.7	(84.3)
Quistadrilus multisetosus	750	458	583	597.0	(84.6)
UIW/OCC[a]	2,292	1,375	2,042	1,903.0	(273.7)
UIW/CC[b]	792	1,083	1,083	986.0	(97.0)
Total Oligochaeta	6,293	5,916	5,626	5,945.0	(193.1)
Arthropoda					
Insecta					
Diptera					
Chironomidae					
Tanypodinae					
Procladiini					
Procladius sp.	10,042	7,500	5,500	7,680.7	(1,314.3)
Orthocladiinae					
Cricotopus bicinctus	0	83	0	27.7	(27.7)

Table B9 concluded

Taxa	Replicate A	Replicate B	Replicate C	Mean	(± SE)
Chironominae					
Chironomini					
Chironomus sp.	0	83	0	27.7	(27.7)
Total Chironomidae	10,042	7,666	5,500	7,736.3	(1,311.6)
Mollusca					
Pelecypoda					
Corbiculidae					
Corbicula fluminea	0	0	42	14.0	(14.0)
Total organisms	16,335	13,582	11,210	13,709.0	(1,480.8)[c]
Total taxa	11	10	11	10.7	(0.3)[c]
Sample diversity	0.97	1.12	1.14	1.08	(0.05)
Sample evenness	0.41	0.49	0.48	0.46	(0.03)

[a] = unidentifiable immatures without capilliform chaetae
[b] = unidentifiable immatures with capilliform chaetae
[c] = total of 17 taxa from 3 replicates

APPENDIX C. Ancillary measurements obtained from the lower Des Plaines River transects, Will and Grundy counties, Illinois, 16 January 1986.

Table C1. Ancillary measurements obtained from lower Des Plaines River transect 1 (RM 284.0) concurrently with the aquatic macroinvertebrate collection of 16 January 1986.

	Site 1R			Site 1M			Site 1L		
Temperature (^{o}C)	8.0			7.0			11.2		
Dissolved oxygen (ppm)	11.1			11.2			11.1		
Replicate	A	B	C	A	B	C	A	B	C
Depth (m)	3.3	2.0	3.0	3.0	4.8	3.0	0.5	0.5	0.7
Substrate	sand gravel	sand gravel	sand gravel	sand gravel	sand gravel	sand gravel	sand gravel cobble	sand gravel	sand gravel

Table C2. Ancillary measurements obtained from lower Des Plaines River transect 2 (RM 278.0) concurrently with the aquatic macroinvertebrate collection of 16 January 1986.

	Site 2R			Site 2M			Site 2L		
Temperature (°C)	5.8			5.8			5.5		
Dissolved oxygen (ppm)	11.7			10.8			11.2		
Replicate	A	B	C	A	B	C	A	B	C
Depth (m)	2.0	2.0	2.0	6.0	6.0	6.0	1.8	1.5	3.5
Substrate	silt sand clay	silt sand clay	silt fine sand clay	petroleum detritus silt sand	petroleum detritus sand silt	petroleum detritus sand silt	silt detritus petroleum	silt detritus petroleum	silt detritus petroleum

Table C3. Ancillary measurements obtained from lower Des Plaines River transect 3 (RM 273.5) concurrently with the aquatic macroinvertebrate collection of 16 January 1986.

	Site 3R			Site 3M			Site 3L		
Temperature (°C)	5.2			5.0			5.0		
Dissolved oxygen (ppm)	11.0			10.5			11.2		
Replicate	A	B	C	A	B	C	A	B	C
Depth (m)	0.5	0.5	0.5	3.0	3.0	3.0	0.6	0.6	0.7
Substrate	fine sand silt detrirus	silt sand detritus	fine sand silt detritus	fine sand silt clay	fine sand silt clay	sand silt clay	clay sand silt	clay sand silt	silt sand

Table C3. Ancillary measurements obtained from lower Des Plaines River transect 3 (RM 273.5) concurrently with the aquatic macroinvertebrate collection of 16 January 1986.

	Site 3R			Site 3M			Site 3L		
Temperature (°C)	5.2			5.0			5.0		
Dissolved oxygen (ppm)	11.0			10.5			11.2		
Replicate	A	B	C	A	B	C	A	B	C
Depth (m)	0.5	0.5	0.5	3.0	3.0	3.0	0.6	0.6	0.7
Substrate	fine sand silt detrirus	silt sand detritus	fine sand silt detritus	fine sand silt clay	fine sand silt clay	sand silt clay	clay sand silt	clay sand silt	silt sand